8

Hydraulics and Fluid Mechanics

8.1. Fluid is a substance that
(*a*) cannot be subjected to shear forces
(*b*) always expands until it fills any container
(*c*) has the same shear stress at a point regardless of its motion
(*d*) cannot remain at rest under action of any shear force
(*e*) flows.

8.2. Fluid is a substance which offers no resistance to change of
(*a*) pressure (*b*) flow
(*c*) shape (*d*) volume
(*e*) temperature.

8.3. Practical fluids
(*a*) are viscous
(*b*) possess surface tension
(*c*) are compressible
(*d*) possess all the above properties
(*e*) possess none of the above properties.

8.4. In a static fluid
(*a*) resistance to shear stress is small
(*b*) fluid pressure is zero
(*c*) linear deformation is small
(*d*) only normal stresses can exist
(*e*) viscosity is nil.

8.5. A fluid is said to be ideal, if it is
(*a*) incompressible (*b*) inviscous
(*c*) viscous and incompressible
(*d*) inviscous and compressible
(*e*) inviscous and incompressible.

8.6. An ideal flow of any fluid must fulfill the following
(*a*) Newton's law of motion
(*b*) Newton's law of viscosity
(*c*) Pascal' law
(*d*) Continuity equation
(*e*) Boundary layer theory.

8.7. If no resistance is encountered by displacement, such a substance is known as
(*a*) fluid (*b*) water
(*c*) gas (*d*) perfect solid
(*e*) ideal fluid.

8.8. The volumetric change of the fluid caused by a resistance is known as
(*a*) volumetric strain
(*b*) volumetric index
(*c*) compressibility
(*d*) adhesion (*e*) cohesion.

8.9. Liquids
(*a*) cannot be compressed
(*b*) occupy definite volume
(*c*) are not affected by change in pressure and temperature
(*d*) are not viscous
(*e*) none of the above.

8.10. Density of water is maximum at
(*a*) 0°C (*b*) 0°K
(*c*) 4°C (*d*) 100°C
(*e*) 20°C.

8.11. Mass density of liquid (ρ) is given by
(*a*) $\rho = \frac{\text{Mass}}{\text{Volume}}$ (*b*) $\rho = \frac{\text{Metric slug}}{m^2}$
(*c*) $\rho = \frac{\text{kg sec}^2}{m^4}$ (*d*) all of the above
(*e*) none of the above.

8.12. The value of mass density in $kgsec^2/m^4$ for water at 0°C is
(*a*) 1 (*b*) 1000
(*c*) 100 (*d*) 101.9
(*e*) 98.1

8.13. Units of mass density are
(*a*) kg/km (*b*) kg/m^3
(*c*) $\frac{kg\ sec}{m^4}$ (*d*) $\frac{kg\ sec^2}{m^2}$
(*e*) $\frac{kg\ sec^2}{m^4}$

8.14. Property of a fluid by which its own molecules are attracted is called
(*a*) adhesion (*b*) cohesion
(*c*) viscosity (*d*) compressibility
(*e*) surface tension.

8.15. Mercury does not wet glass. This is due to property of liquid known as
(*a*) adhesion (*b*) cohesion
(*c*) surface tension
(*d*) viscosity (*e*) compressibility.

8.16. The property of a fluid which enables it to resist tensile stress is known as
(*a*) compressibility
(*b*) surface tension
(*c*) cohesion (*d*) adhesion
(*e*) viscosity.

8.17. Property of a fluid by which molecules of different kinds of fluids are attracted to each other is called
(*a*) adhesion (*b*) cohesion
(*c*) viscosity (*d*) compressibility
(*e*) surface tension.

8.18. The specific weight of water is 1000 kg/m^3
(*a*) at normal pressure of 760 mm
(*b*) at 4°C temperature
(*c*) at mean sea level
(*d*) all the above (*e*) none of the above.

8.19. Specific weight of water in S.I. units is equal to
(*a*) 1000 N/m^3 (*b*) 10000 N/m^3
(*c*) $9.81 \times 10^3\ N/m^3$
(*d*) $9.81 \times 10^6\ N/m^3$
(*e*) 9.81 N/m^3.

8.20. When the flow parameters at any given instant remain same at every point, then flow is said to be
(*a*) quasi static (*b*) steady state
(*c*) laminar (*d*) uniform
(*e*) static.

8.21. Which of the following is demensionless
(*a*) specific weight
(*b*) specific volume
(*c*) specific speed
(*d*) specific gravity
(*e*) specific viscosity.

8.22. The normal stress in a fluid will be constant in all directions at a point only if
(*a*) it is incompressible
(*b*) it has uniform viscosity
(*c*) it has zero viscosity
(*d*) it is frictionless
(*e*) it is at rest.

8.23. The pressure at a point in a fluid will not be same in all the directions when the fluid is
(*a*) moving (*b*) viscous
(*c*) viscous and static
(*d*) inviscous and moving
(*e*) viscous and moving.

8.24. An object having 10 kg mass weighs 9.81 kg on a spring balance. The value of 'g' at this place is
(*a*) 10 m/sec^2 (*b*) 9.81 m/sec^2
(*c*) 10.2/m sec (*d*) 9.75 m/sec^2
(*e*) 9 m/sec^2.

8.25. The tendency of a liquid surface to contract is due to the following property
(*a*) cohesion (*b*) adhesion
(*c*) viscosity (*d*) surface tension
(e) elasticity.

8.26. The surface tension of mercury at normal temperature compared to that of water is
(*a*) more (*b*) less
(*c*) same
(*d*) more or less depending on size of glass tube
(*e*) none of the above.

8.27. A perfect gas
(*a*) has constant viscosity
(*b*) has zero viscosity
(*c*) is incompressible
(*d*) is of theoretical interest
(*e*) none of the above.

8.28. For very great pressures, viscosity of most gases and liquids
(*a*) remains same (*b*) increases

(*c*) decreases
(*d*) shows erratic behaviour
(*e*) none of the above.

8.29. Fig. 8.1 shows four curves *A, B, C, D* on a plot of viscous shear stress versus velocity gradient for three fluids, viz., newtonian, non-newtonian and ideal; and an ideal solid. For ideal solid, the curve applicable is
(*a*) *A* (*b*) *B*
(*c*) *C* (*d*) *D*
(*e*) none of the above.

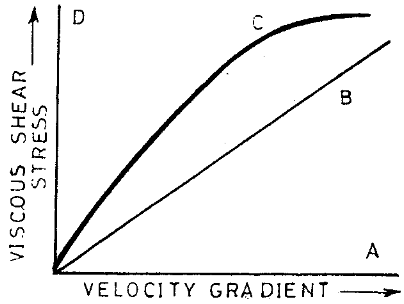

Fig. 8.1.

8.30. In Fig. 8.1, for ideal fluid, curve applicable is
(*a*) *A* (*b*) *B*
(*c*) *C* (*d*) *D*
(*e*) none of the above.

8.31. In Fig. 8.1, for newtonian fluid, curve applicable is
(*a*) *A* (*b*) *B*
(*c*) *C* (*d*) *D*
(*e*) none of the above.

8.32. In Fig. 8.1, for non-newtonian fluid, curve applicable is
(*a*) *A* (*b*) *B*
(*c*) *C* (*d*) *D*
(*e*) none of the above.

8.33. A fluid in equilibrium can't sustain
(*a*) tensile stress (*b*) compressive stress
(*c*) shear stress (*d*) bending stress
(*e*) all of the above.

8.34. Viscosity of water in comparison to mercury is
(*a*) higher (*b*) lower
(*c*) same
(*d*) higher/lower depending on temperature
(*e*) unpredictable.

8.35. The bulk modulus of elasticity with increase in pressure
(*a*) increases (*b*) decreases
(*c*) remains constant
(*d*) increases first upto certain limit and then decreases
(*e*) unpredictable.

8.36. The bulk modulus of elasticity
(*a*) has the dimensions of 1/pressure
(*b*) increases with pressure
(*c*) is large when fluid is more compressible
(*d*) is independent of pressure and viscosity
(*e*) is directly proportional to flow.

8.37. A balloon lifting in air follows the following principle
(*a*) law of gravitation
(*b*) Archimedes principle
(*c*) principle of buoyancy
(*d*) all of the above
(*e*) continuity equation.

8.38. The value of the coefficient of compressibility for water at ordinary pressure and temperature in kg/cm^3 is equal to
(*a*) 1000 (*b*) 2100
(*c*) 2700 (*d*) 10,000
(*e*) 21,000.

8.39. The increase of temperature results in
(*a*) increase in viscosity of gas
(*b*) increase in viscosity of liquid
(*c*) decrease in viscosity of gas
(*d*) decrease in viscosity of liquid
(*e*) (*a*) and (*d*) above.

8.40. Surface tension has the units of
(*a*) newtons/m^2 (*b*) newtons/m^2
(*c*) new tons/m (*d*) newtons
(*e*) newton m.

8.41. Surface tension
(*a*) acts in the plane of the interface normal to any line in the surface
(*b*) is also known as capillarity
(*c*) is a function of the curvature of the interface
(*d*) decreases with fall in temperature
(*e*) has no units.

8.42. The stress-strain relation of the newtoneon fluid is
(*a*) linear (*b*) parabolic
(*c*) hyperbolic (*d*) inverse type

(*e*) none of the above.

8.43. A liquid compressed in cylinder has a volume of 0.04 m^3 at 50 kg/cm^2 and a volume of 0.039 m^3 at 150 kg/cm^2. The bulk modulus of elasticity of liquid is
(*a*) 400 kg/cm^2 (*b*) 4000 kg/cm^2
(*c*) 40×10^5 kg/cm^2
(*d*) 40×10^6 kg/cm^2
(*e*) none of the above.

8.44. The units of viscosity are
(*a*) $metres^2$ per sec
(*b*) kg sec/$metre^2$
(*c*) newton-sec per $metre^2$
(*d*) newton-sec^2 per metre
(*e*) none of the above.

8.45. Kinematic viscosity is dependent upon
(*a*) pressure (*b*) distance
(*c*) level (*d*) flow
(*e*) density.

8.46. Units of surface tension are
(*a*) energy/unit area
(*b*) distance (*c*) both of the above
(*d*) it has no units (*e*) none of the above.

8.47. Which of the following meters is not associated with viscosity
(*a*) Red wood (*b*) Say bolt
(*c*) Engler (*d*) Orsat
(*e*) none of the above.

8.48. Choose the correct relationship
(*a*) specific gravity = gravity × density
(*b*) dynamic viscosity = kinematic viscosity × density
(*c*) gravity = specific gravity × density
(*d*) kinematic viscosity = dynamic viscosity × density
(*e*) hydrostatic force = surface tension × gravity.

8.49. Dimensions of surface tension are
(*a*) $M^1L^0T^{-2}$ (*b*) $M^1L^0T^{-1}$
(*c*) $M^1L^1T^{-2}$ (*d*) $M^1L^2T^{-2}$
(*e*) $M^1L^0T^1$.

8.50. For manometer, a better liquid combination is one having
(*a*) higher surface tension
(*b*) lower surface tension
(*c*) surface tension is no criterion
(*d*) high density and viscosity
(*e*) low density and viscosity.

8.51. If mercury in a barometer is replaced by water, the height of 3.75 cm of mercury will be following cm of water
(*a*) 51 cm (*b*) 50 cm
(*c*) 52 cm (*d*) 52.2 cm
(*e*) 51.7 cm.

8.52. Choose the wrong statement.
Alcohol is used in manometer, because
(*a*) its vapour pressure is low
(*b*) it provides suitable meniscus for the inclined tube
(*c*) its density is less
(*d*) it provides longer length for a given pressure difference
(*e*) it provides accurate readings.

8.53. Increase in pressure at the outer edge of a drum of radius R due to rotation at ω rad/sec, full of liquid of density ρ will be
(*a*) $\rho\omega^2R^2$ (*b*) $\rho\omega^2R^2/2$
(*c*) $2\rho\omega^2R^2$ (*d*) $\rho\omega^2R/2$
(*e*) none of the above.

8.54. The property of fluid by virtue of which it offers resistance to shear is called
(*a*) surface tension
(*b*) adhesion (*c*) cohesion
(*d*) viscosity (*e*) all of the above.

8.55. Choose the wrong statement
(*a*) fluids are capable of flowing
(*b*) fluids conform to the shape of the containing vessels
(*c*) when in equilibrium, fluids cannot sustain tangential forces
(*d*) when in equilibrium, fluids can sustain shear forces
(*e*) fluids have some degree of compressibility and offer little resistance to form.

8.56. The density of water is 1000 kg/m^3 at
(*a*) 0°C (*b*) 0°K
(*c*) 4°C (*d*) 20°C
(*e*) all temperature.

8.57. If w is the specific weight of liquid and h the depth of any point from the surface, then pressure intensity at that point will be
(*a*) h (*b*) wh
(*c*) w/h (*d*) h/w
(*e*) $1/wh$.

8.58. Choose the wrong statement

(a) Viscosity of a fluid is that property which determines the amount of its resistance to a shearing force
(b) Viscosity is due primarily to interaction between fluid molecules
(c) Viscosity of liquids decreases with increase in temperature
(d) Viscosity of liquids is appreciably affected by change in pressure
(e) Viscosity is expressed as poise, stoke, or saybolt seconds.

8.59. The units of kinematic viscosity are
(a) metres^2 per sec
(b) kg sec/metre^2
(c) newton-sec per metre^2
(d) newton-sec^2 per metre
(e) none of the above.

8.60. The ratio of absolute viscosity to mass density is known as
(a) specific viscosity
(b) viscosity index
(c) kinematic viscosity
(d) coefficient of viscosity
(e) coefficient of compressibility.

8.61. Kinematic viscosity is equal to
(a) dynamic viscosity/density
(b) dynamicviscosity × density
(c) density/dynamic viscosity
(d) 1/dynamicviscosity × density
(e) same as dynamic viscosity.

8.62. Which of the following is the unit of kinematic viscosity
(a) pascal (b) poise
(c) stoke (d) faraday
(e) none of the above.

8.63. A one dimensional flow is one which
(a) is uniform flow
(b) is steady uniform flow
(c) takes place in straight lines
(d) involves zero transverse component of flow
(e) takes place in one dimension.

8.64. Alcohol is used in manometers because
(a) it has low vapour pressure
(b) it is clearly visible
(c) it has low surface tension
(d) it can provide longer column due to low density
(e) is provides suitable meniscus.

8.65. A pressure of 25 m of head of water is equal to
(a) 25 kN/m^2 (b) 245 kN/m^2
(c) 2500 kN/m^2 (d) 2.5kN/m^2
(e) 12.5 kN/m^2.

8.66. Specific weight of sea water is more that of pure water because it contains
(a) dissolved air (b) dissolved salt
(c) suspended matter
(d) all of the above
(e) heavy water.

8.67. If 850 kg liquid occupies volume of one cubic meter, then 0.85 represents its
(a) specific weight
(b) specific mass (c) specific gravity
(d) specific density
(e) none of the above.

8.68. $V = 0.0022t - \frac{1.8}{t}$ is the equation to determine kinematic viscosity of liquids by
(a) Redwood viscometer
(e) Engler viscometer
(c) Saybolt universal viscometer
(d) Newton viscometer
(e) none of the above.

8.69. Free surface of a liquid tends to contract to the smallest possible area due to force of
(a) surface tension
(b) viscosity (c) friction
(d) cohesion (d) adhesion.

8.70. A bucket of water is hanging from a spring balance. An iron piece is suspended into water without touching sides of bucket from another support. The spring balance reading will
(a) increase (b) decrease
(c) remain same
(d) increase/decrease depending on depth of immersion
(e) unpredictable.

8.71. Falling drops of water become spheres due to the property of
(a) adhesion (b) cohesion
(c) surface tension
(d) viscosity (e) compressibility.

8.72. A liquid would wet the solid, if adhesion forces as compared to cohesion forces are
(a) less (b) more

(c) equal
(d) less at low temperature and more at high temperature
(e) there is no such criterion.

8.73. If cohesion between molecules of a fluid is greater than adhesion between fluid and glass, then the free level of fluid in a dipped glass tube will be
(a) higher than the surface of liquid
(b) the same as the surface of liquid
(c) lower than the surface of liquid
(d) unpredictable
(e) none of the above.

8.74. The point in the immersed body through which the resultant pressure of the liquid may be taken to act is known as
(a) meta centre (b) centre of pressure
(c) centre of buoyancy
(d) centre of gravity
(e) none of the above.

8.75. The total pressure on the surface of a vertical sluice gate 2 m × 1 m with its top 2 m surface being 0.5 m below the water level will be
(a) 500 kg (b) 1000 kg
(c) 1500 kg (d) 2000 kg
(e) 4000 kg.

8.76. The resultant upward pressure of a fluid on a floating body is equal to the weight of the fluid displaced by the body. This definition is according to
(a) Buoyancy
(b) Equilibrium of a floating body
(c) Archimedes' principle
(d) Bernoulli's theorem
(e) Metacentric principle.

8.77. The resultant upward pressure of the fluid on an immersed body is called
(a) upthrust (b) buoyancy
(c) centre of pressure
(d) all the above are correct
(e) none of above is correct.

8.78. The conditions for the stable equilibrium of a floating body are
(a) the meta-centre should lie above the centre of gravity
(b) the centre of buoyancy and the centre of gravity must lie on the same vertical line
(c) a righting couple should be formed
(d) all the above are correct
(e) none of the above is correct.

8.79. Poise is the unit of
(a) surface tension (b) capillarity
(c) viscosity (d) shear stress in fluids
(e) buoyancy.

8.80. Metacentric height is given as the distance between
(a) the centre of gravity of the body and the metacentre
(b) the centre of gravity of the body and the centre of buoyancy
(c) the centre of gravity of the body and the centre of pressure
(d) centre of buoyancy and metacentre
(e) none of the above.

8.81. The buoyancy depends on
(a) mass of liquid displaced
(b) viscosity of the liquid
(c) pressure of the liquid displaced
(d) depth of immersion
(e) none of the above.

8.82. The centre of gravity of the volume of the liquid displaced by an immersed body is called
(a) meta-centre
(b) centre of pressure
(c) centre of buoyancy
(d) centre of gravity
(e) none of the above.

8.83. A piece of metal of specific gravity 13.6 is placed in mercury of specific gravity 13.6, what fraction of it volume is under mercury?
(a) the metal piece will simply float over the mercury
(b) the metal piece will be immersed in mercury by half
(c) whole of the metal piece will be immersed with its top surface just at mercury level
(d) metal piece will sink to the bottom
(e) none of the above.

8.84. The angle of contact in case of a liquid depends upon
(a) the nature of the liquid and the solid
(b) the material which exists above the free surface of the liquid

(c) both of the above
(d) any one of the above
(e) none of the above.

8.85. Free surface of a liquid behaves like a sheet and tends to contract to smallest possible area due to the
(a) force of adhesion
(b) force of cohesion
(c) force of friction
(d) force of diffusion
(e) none of the above.

8.86. Rain drops are spherical because of
(a) viscosity (b) air resistance
(c) surface tension forces
(d) atmospheric pressure
(e) none of the above.

8.87. Surface energy per unit area of a surface is numerically equal to
(a) atmospheric pressure
(b) surface tension
(c) force of adhesion
(d) force of cohesion
(e) viscosity.

8.88. The capillary rise at 20°C in a clean glass tube of 1 mm bore containing water is approximately
(a) 1 mm (b) 5 mm
(c) 10 mm (d) 20 mm
(e) 30 mm.

8.89. The difference of pressure between the inside and outside of a liquid drop is
(a) $p = T \times r$ (b) $p = T/r$
(c) $p = T/2r$ (d) $p = 2T/r$
(e) none of the above.

8.90. If the surface of liquid is convex, then
(a) cohesion pressure is negligible
(b) cohesion pressure is decreased
(c) cohesion pressure is increased
(d) there is no cohesion pressure
(e) none of the above.

8.91. To avoid vaporisation in the pipe line, the pipe line over the ridge is laid such that it is not more than
(a) 2.4 m above the hydraulic gradient
(b) 6.4 m above the hydraulic gradient
(c) 10.0 m above the hydraulic gradient
(d) 5.0 above the hydraulic gradient
(e) none of the above.

8.92. To avoid an interruption in the flow of a syphon, an air vessel is provided
(a) at the inlet (b) at the outlet
(c) at the summit
(d) ay nay point between inlet and outlet
(e) none of the above.

8.93. The vapour pressure over the concave surface is
(a) less than the vapour pressure over the plane surface
(b) equal to the vapour pressure over the plane surface
(c) greater than the vapour pressure over the plane surface
(d) zero (e) none of the above.

8.94. The peoperty by virtue of which a liquid opposes relative motion between its different layers is called
(a) surface tension
(b) co-efficient of viscosity
(c) viscosity (d) osmosis
(e) cohesion.

8.95. The process of diffusion of one liquid into the other through a semi-permeable membrane is called
(a) viscosity (b) osmosis
(c) surface tension
(d) cohesion (e) diffusivity.

8.96. The units of dynamic or absolute viscosity are
(a) metres^2 per sec (b) kg sec/metre
(c) newton-sec per metre^2
(d) newton-sec^2 per metre
(e) none of the above.

8.97. The dimensions of coefficient of viscosity are
(a) $M^1L^{-1}T^{-1}$ (b) $M^{-1}L^{-1}T^{-1}$
(c) $M^1L^1T^{-1}$ (d) $M^{-1}L^1T^1$
(e) $M^1L^{-1}T^1$.

8.98. The continuity equation is connected with
(a) viscous/unviscous fluids
(b) compressibility of fluids
(c) conservation of mass
(d) steady/unsteady flow
(e) open channel/pipe flow.

8.99. The rise or depression of liquid in a tube due to surface tension with increase in size of tube will

(*a*) increase
(*b*) remain unaffected
(*c*) may increase or decrease depending on the characteristics of liquid
(*d*) decrease
(*e*) unpredictable.

8.100. Liquids transmit pressure equally in all the directions. This is according to
(*a*) Boyle's law
(*b*) Archimedes principle
(*c*) Pascal's law (*d*) Newton's formula
(*e*) Chezy's equation.

8.101. Capillary action is due to the
(*a*) surface tension
(*b*) cohesion of the liquid
(*c*) adhesion of the liquid molecules and the molecules on the surface of a solid
(*e*) all of the above
(*e*) none of the above.

8.102. The rise or fall of head '*h*' in a capillary tube of diameter '*d*' and liquid surface tension 'σ' and specific weight '*w*' is equal to
(*a*) $\frac{4\sigma}{wd}$ (*b*) $\frac{4d\sigma}{w}$
(*c*) $\frac{4wd}{\sigma}$ (*d*) $\frac{4w\sigma}{d}$
(*e*) $\frac{4d}{w\sigma}$.

8.103. Newton's law of viscosity is a relationship between
(*a*) shear stress and the rate of angular distortion
(*b*) shear stress and viscosity
(*c*) shear stress, velocity and viscosity
(*d*) pressure, velocity and viscosity
(*e*) shear stress, pressure and rate of angular distortion.

8.104. The atmospheric pressure with rise in altitude decreases
(*a*) linearly
(*b*) first slowly and then steeply
(*c*) first steeply and then gradually
(*d*) unpredictable
(*e*) none of the above.

8.105. Pressure of the order of 10^{-10} torr can be measured by
(*a*) Bourdon tube (*b*) Pirani Gauge
(*c*) micro-manometer
(*d*) ionisastion gauge
(*e*) McLeod gauge.

8.106. Operation of McLeod gauge used for low pressure measurement is based on the principle of
(*a*) gas law (*b*) Boyle's law
(*c*) Charle's law (*d*) Pascal's law
(*e*) McLeod's law.

8.107. An odd shaped body weighing 7.5 kg and occupying 0.01 m^3 volume will be completely submerged in a fluid having specific gravity of
(*a*) 1 (*b*) 1.2
(*c*) 0.8 (*d*) 0.75
(*e*) 1.25.

8.108. In an isothermal atmosphere, the pressure
(*a*) decreases linearly with elevation
(*b*) remains constant
(*c*) varies in the same way as the density
(*d*) increases exponentially with elevation
(*e*) unpredictable.

8.109. Mercury is often used in barometer because
(*a*) it is the best liquid
(*b*) the height of barometer will be less
(*c*) its vapour pressure is so low that it may be neglected
(*d*) both (*b*) and (*c*)
(*e*) it moves easily.

8.110. Barometer is used to measure
(*a*) pressure in pipes, channels etc.
(*b*) atmospheric pressure
(*c*) very low pressure
(*d*) difference of pressure between two points
(*e*) rain level.

8.111. Which of the following instrument can be used for measuring speed of a submarine moving in deep sea
(*a*) Venturimeter (*b*) Orifice plate
(*c*) hot wire anemometer
(*d*) rotameter (*e*) pitot tube.

8.112. Which of the following instrument can be used for measuring speed of an aeroplane
(*a*) Venturimeter (*b*) Orifice plate
(*c*) hot wire anemometer
(*d*) rotameter (*e*) pitot tube.

8.113. Piezometer is used to measure
(*a*) pressure in pipe, channels etc.

(b) atmospheric pressure
(c) very low pressures
(d) difference of pressure between two points
(e) flow.

8.114. Which of the following instruments is used to measure flow on the application of Bernoulli's theorem
(a) Venturimeter (b) Orifice plate
(c) nozzle (d) pitot tube
(e) all of the above.

8.115. The speed of sound in a perfect gas is given by
(a) $\sqrt{\frac{k \text{ (ratio of specific heat capacities}}{R \text{ (gas constant)} \times T \text{ (absolute temp)}}}$
(b) $\sqrt{kT/R}$ (c) $\sqrt{kR/T}$
(d) $\sqrt{kRT}$ (e) $(kRT)^2$.

8.116. The speed of sound in a ideal gas varies directly as its
(a) pressure (b) temperature
(c) density
(d) modulus of elasticity
(e) absolute temperature.

8.117. Speed of sound in water is equal to
(a) $\sqrt{\frac{K \text{ (bulb modulus)}}{\sigma \text{(density)}}}$
(b) $\sqrt{K\sigma}$ (c) $\sqrt{\sigma/K}$
(d) K/σ (e) σ/K.

8.118. Flow maters based on obstruction principle like orifice plates can be used with Reynold's number upto approximately
(a) 500 (b) 1000
(c) 2000 (d) 4000
(e) 10000.

8.119. Dynamic viscosity of most of the liquids with rise in temperature
(a) increases (b) decreases
(c) remains unaffected
(d) unpredictable (e) none of the above.

8.120. Dynamic viscosity of most of the gases with rise in temperature
(a) increases (b) decreases
(c) remains unaffected
(d) unpredictable (e) none of the above.

8.121. A metal with specific gravity of σ floating in a fluid of same specific gravity σ will
(a) sink to bottom
(b) float over fluid
(c) partly immersed
(d) be fully immersed with top surface at fluid surface
(e) none of the above.

8.122. Which curve is applicable for the newtonian fluid in Fig 8.2.

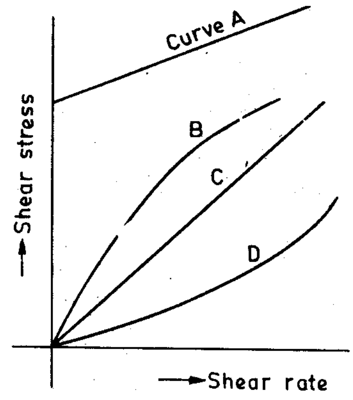

Fig. 8.2.

(a) curve A (b) curve B
(c) curve C (d) curve D
(e) none of the above.

8.123. Euler's dimensionless number relates the following
(a) inertial force and gravity
(b) viscous force and inertial force
(c) viscous force and buoyancy force
(d) pressure force and inertial force
(e) pressure force and viscous force.

8.124. Fig. 8.3 shows the capillarity action in circular glass tubes for various liquids. For mercury following curve holds

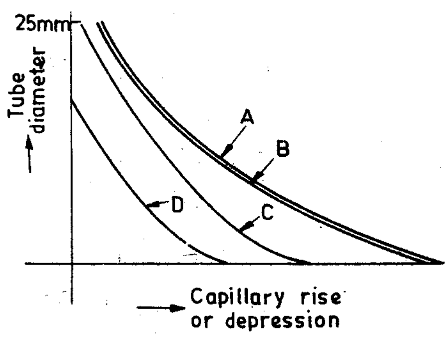

Fig. 8.3.

(*a*) curve *A* (*b*) curve *B*
(*c*) curve *C* (*d*) curve *D*
(*e*) none of the above.

8.125. For tap water, following curve holds (Refer Fig. 8.3)
(*a*) curve *A* (*b*) curve *B*
(*c*) curve *C* (*d*) curve *D*
(*e*) none of the above.

8.126. For distilled water at very low temperature follwoing curve holds (Refer Fig. 8.3)
(*a*) curve *A* (*b*) curve *B*
(*c*) curve *C* (*d*) curve *D*
(*e*) none of the above.

8.127. For distilled water at higher temperature, following curve holds (Refer Fig. 8.3)
(*a*) curve *A* (*b*) curve *B*
(*c*) curve *C* (*d*) curve *D*
(*e*) none of the above.

8.128. Manometer is used to measure
(*a*) pressure in pipes, channels etc.
(*b*) atmospheric pressure
(*c*) very low pressure
(*d*) difference of pressure between two points
(*e*) velocity.

8.129. Which of the following manometer has highest sensitivity
(*a*) U-tube with water
(*b*) inclined U-tube
(*c*) U-tube with mercury
(*d*) micro-manometer with water
(*e*) displacement type.

8.130. In order to increase sensitivity of U-tube manometer, one leg is usually inclined by angle θ. Sensitivity of inclined tube to sensitivity of U-tube is equal to
(*a*) $\sin\theta$ (*b*) $\frac{1}{\sin\theta}$
(*c*) $\cos\theta$ (*d*) $\frac{1}{\cos\theta}$
(*e*) $\tan\theta$.

8.131. Working principle of dead weight pressure gauge tester is based on
(*a*) Pascal's law
(*b*) Dalton's law of partial pressure
(*c*) Newton's law of viscosity
(*d*) Avogadro's hypothesis
(*e*) Second law of thermodynamic.

8.132. The resultant of all normal pressures acts
(*a*) at c.g. of body
(*b*) at centre of pressure
(*c*) vertically upwards
(*d*) at metacentre
(*e*) vertically downwards.

8.133. Centre of pressure compared to c.g. is
(*a*) above it (*b*) below it
(*c*) at same point
(*d*) above or below depending on area of body
(*e*) none of the above.

8.134. Metacentric height is the distance between the metacentre and
(*a*) water surface (*b*) centre of pressure
(*c*) centre of gravity
(*d*) centre of buoyancy
(*e*) none of the above.

8.135. The resultant upward pressure of the fluid on an immersed body due to its tendency to uplift the sub-merged body is called
(*a*) upthrust (*b*) reaction
(*c*) buoyancy (*d*) metacentre
(*e*) centre of pressure.

8.136. The centre of pressure of a surface subjected to fluid pressure is the point
(*a*) on the surface at which resultant pressure acts
(*b*) on the surface at which gravitational force acts
(*c*) at which all hydraulic forces meet
(*d*) similar to metacentre
(*e*) where pressure equivalent to hydraulic thrust will act.

8.137. Buoyant force is
(*a*) the resultant force acting on a floating body
(*b*) the resultant force on a body due to the fluid surrounding it
(*c*) equal to the volume of liquid displaced
(*d*) the force necessary to maintain equilibrium of a submerged body
(*e*) none of the above.

8.138. The horizontal component of buoyant force is
(*a*) negligible
(*b*) same as buoyant force
(*c*) zero

(*d*) buoyant force × tan θ
(*e*) none of the above.

8.139. The force of buoyancy is dependent on
(*a*) mass of liquid displaced
(*b*) viscosity of fluid
(*c*) surface tension of fluid
(*d*) depth of immersion
(*e*) centre of pressure.

8.140. The line of action of the buoyant force acts through the
(*a*) centroid of the volume of fluid vertically above the body
(*b*) centre of the volume of floating body
(*c*) centre of gravity of any submerged body
(*d*) centriod of the displaced volume of fluid
(*e*) none of the above.

8.141. Centre of buoyancy is the
(*a*) centroid of the displaced volume of fluid
(*b*) centre of pressure of displaced volume
(*c*) c.g. of floating body
(*d*) does not exist
(*e*) none of the above.

8.142. A body floats in stable equilibrium
(*a*) when its meatcentric height is zero
(*b*) when the metancentre is above c.g.
(*c*) when its c.g. is below it's centre of buoyancy
(*d*) metacentre has nothing to do with position of c.g. for determining stability
(*e*) none of the above.

8.143. A piece weighing 3 kg in air was found to weigh 2.5 kg when submerged in water. Its specific gravity is
(*a*) 1 (*b*) 5
(*c*) 7 (*d*) 6
(*e*) 1 2.

8.144. A vertical wall is subjected to liquid (of specific weight '*w*') pressure on one side. If *h* be height of liquid surface, then total pressure on wall per unit length is
(*a*) wh (*b*) $\frac{wh}{2}$
(*c*) $\frac{wh^2}{12}$ (*d*) $\frac{2}{3}wh$
(*e*) $\frac{2}{3}wh^2$

8.145. The total pressure on the wall in above case acts at following distance from liquid surface
(*a*) $\frac{h}{2}$ (*b*) $\frac{h}{3}$
(*c*) $\frac{2}{3}h$ (*d*) $\frac{3}{4}h$
(*e*) $\frac{2}{5}h$.

8.146. The total pressure on a horizontally immersed surface (of surface area *A*) with its c.g. at a depth $\bar{x}$ from liquid surface in a liquid of specific weight *w* is
(*a*) $w{\cdot}A$ (*b*) $w{\cdot}\bar{x}$
(*c*) $\frac{wA}{\bar{x}}$ (*d*) $\frac{w\bar{x}}{A}$
(*e*) $wA\bar{x}$.

8.147. If the surface in above case is inclined at angle θ with the liquid surface, then total pressure on the immersed surface will be
(*a*) $wA\bar{x}$ (*b*) $wA\bar{x}\cos\theta$
(*c*) $wA\bar{x}\sin\theta$ (*d*) $wA\bar{x}\tan\theta$
(*e*) $wA\bar{x}\sec\theta$.

8.148. The location of resultant force acting on a body submerged in water (*i.e.* depth of centre of pressure) will be
(*a*) $h_G + \frac{I_G}{h_G A}$ (*b*) $h_G + \frac{h_G A}{I_G}$
(*c*) $h_G - \frac{I_G}{h_G A}$ (*d*) $h_G + \frac{h_G}{I_G A}$
(*e*) $h_G + \frac{A}{h_G I_G}$.
where
h_G = depth of the centroid of the surface,
A = area.
I_G = M.I. of the surface about an axis lying in the surface, passing through its centroid, and parallel to the free surface.

8.149. The centre of pressure for a vertically immersed surface lies at following distance from c.g.
(*a*) $\frac{I_G}{Ah_G}$ below (*b*) $\frac{I_G}{Ah_G}$ above
(*c*) 0 (*d*) $\frac{Ah_G}{I_G}$ below

(*e*) $\frac{Ah_G}{I_G}$ above.

8.150. The depth of centre of pressure for an immersed surface inclined at angle θ with the liquid surface lies at following distance from c.g.

(*a*) $\frac{I_G \sin^2 \theta}{Ah_G}$ below

(*b*) $\frac{I_G \sin^2 \theta}{Ah_G}$ above

(*c*) $\frac{I_G \sin \theta}{Ah_G}$ below

(*d*) $\frac{I_G \sin \theta}{A\bar{x}}$ above

(*e*) 0.

8.151. The total pressure force on a plane area is equal to the area multiplied by the intensity of pressure at the centriod, if

(*a*) the area is horizontal
(*b*) the area is vertical
(*c*) the area is inclined
(*d*) all of the above
(*e*) none of the above.

8.152. A square surface 3 m × 3 m lies in a vertical line in water with its upper edge at water surface. The hydrostatic force on square surface is

(*a*) 9,000 kg (*b*) 13,500 kg
(*c*) 18,000 kg (*d*) 27,000 kg
(*e*) 30,000 kg.

8.153. The depth of the centre of pressure on a vertical rectangular gate 8 m wide and 6 m high, when the water surface coincides with the top of the gate, is

(*a*) 2.4 m (*b*) 3.0 m
(*c*) 4.0 m (*d*) 2.5 m
(*e*) 5.0 m.

8.154. If the atmospheric pressure on the surface of an oil tank (sp. gr. 0.8) is 0.2 kg/cm^2, the pressure at a depth of 50 m below the oil surface will be

(*a*) 2 metres of water column
(*b*) 3 metres of water column
(*c*) 5 metres of water column
(*d*) 6 metres of water column
(*e*) 7 metres of water column.

8.155. Metacentre is the point of intersection of

(*a*) vertical upward force through c.g. of body and centre line of body
(*b*) buoyant force and the centre line of body
(*c*) mid point between c.g. and centre of buoyancy
(*d*) all of the above
(*e*) none of the above.

8.156. Choose the wrong statement

(*a*) The horizontal component of the hydro-static force on any surface is equal to the normal force on the vertical projection of the surface
(*b*) The horizontal component acts through the centre of pressure for the vertical projection
(*c*) The vertical component of the hydrostatic force on any surface is equal to the weight of the volume of the liquid above the area
(*d*) he vertical component passes through the centre of pressure of the volume
(*e*) Centre of pressure acts at a greater depth than centre of gravity.

8.157. For a body floating in a liquid the normal pressure exerted by the liquid acts at

(*a*) bottom surface of the body
(*b*) c.g. of the body
(*c*) metacentre
(*d*) all points on the surface of the body
(*e*) all of the above.

8.158. Choose the wrong statement

(*a*) any weight, floating or immersed in a liquid, is acted upon by a buoyant force
(*b*) Buoyant force is equal to the weight of the liquid displaced
(*c*) The point through which buoyant force acts is called the centre of buoyancy
(*d*) Centre of buoyancy is located above the centre of gravity of the displaced liquid
(*e*) Relative density of liquids can be determined by means of the depth of flotation of hydrometer.

8.159. According to the principle of buoyancy a body totally or partially immersed in a fluid will be lifted up by a force equal to

(*a*) the weight of the body

(*b*) more than the weight of the body
(*c*) less than the weight of the body
(*d*) weight of the fluid displaced by the body
(*e*) weight of body plus the weight of the fluid displaced by the body.

8.160. When a body floating in a liquid, is displaced slightly, it oscillates about
(*a*) c.g. of body (*b*) centre of pressure
(*c*) centre of buoyancy
(*d*) metacentre (*e*) liquid surface.

8.161. Buoyant force is
(*a*) resultant force acting on a floating body
(*b*) equal to the volume of liquid displaced
(*c*) force necessary to keep a body in equilibrium
(*d*) the resultant force on a body due to the fluid surrounding it
(*e*) none of the above.

8.162. Ratio of inertia force to surface tension is known as
(*a*) Mach number
(*b*) Froude number
(*c*) Reynold's number
(*d*) Weber's number
(*e*) none of the above.

8.163. A ship whose hull length is 100 m is to travel at 10 m/sec. For dynamic similarity, at what velocity should a 1:25 model be towed through water ?
(*a*) 10 m/sec (*b*) 25 m/sec
(*c*) 2 m/sec (*d*) 50 m/sec
(*e*) 250 m/sec.

8.164. A model of a reservior is drained in 4 mts by opening the sluice gate. The model scale is 1: 225. How long should it take to empty the prototype ?
(*a*) 900 minutes (*b*) 4 minutes
(*c*) $4 \times (225)^{3/2}$ minutes
(*d*) $4\,(225)^{1/3}$ minutes
(*e*) $4 \times \sqrt{225}$ minutes.

8.165. A model of torpedo is tested in a towing tank at a velocity of 25 m/sec. The prototype is expected to attain a velocity of 5 m/sec. What model scale has been used ?
(*a*) 1 : 5 (*b*) 1 : 2.5
(*c*) 1 : 25 (*d*) $1 : \sqrt{5}$
(*e*) $1 : 5^{3/2}$

8.166. Ratio of inertia force to elastic force is known as
(*a*) Mach number
(*b*) Froude number
(*c*) Reynold's number
(*d*) Weber's number
(*e*) none of the above.

8.167. For a floating body to be in stable equilibrium, its metacentre should be
(*a*) below the centre of gravity
(*b*) below the centre of buoyancy
(*c*) above the centre of buoyancy
(*d*) between c.g. and centre of pressure
(*e*) above the centre of gravity.

8.168. For a floating body to be in equilibrium
(*a*) meta centre should be above c.g.
(*b*) centre of buoyancy and c.g. must lie on same vertical plane
(*c*) a righting couple should be formed
(*d*) all of the above
(*e*) none of the above.

8.169. The two important forces for a floating body are
(*a*) buoyancy, gravity
(*b*) buoyancy, pressure
(*c*) buoyancy, inertial
(*d*) inertial, gravity
(*e*) gravity, pressure.

8.170. Choose the wrong statement
(*a*) The centre of buoyancy is located at the centre of gravity of the displaced liquid
(*b*) For stability of a submerged body, the centre of gravity of body must lie directly below the centre of buoyancy
(*c*) If c.g. and centre of buoyancy coincide, the submerged body must lie at neutral equilibrium for all positions
(*d*) For stability of floating cylinders or spheres, the c.g. of body must lie below the centre of buoyancy
(*e*) All floating bodies are stable.

8.171. Centre of pressure on an inclined plane is
(*a*) at the centroid (*b*) above the centroid
(*c*) below the centroid
(*d*) at metacentre
(*e*) at centre of pressure.

8.172. An open vessel of water is accelerated up an inclined plane. The free water surface will
(*a*) be horizontal
(*b*) make an angle in direction of inclination of inclined plane
(*c*) make an angle in opposite direction to inclination of inclined plane
(*d*) any one of above is possible
(*e*) none of the above.

8.173. The line of action of the buoyant force acts through the centroid of the
(*a*) submerged body
(*b*) volume of the floating body
(*c*) volume of the fluid vertically above the body
(*d*) displaced volume of the fluid
(*e*) none of the above.

8.174. Resultant pressure of the liquid in the case of an immersed body acts through
(*a*) centre of gravity
(*b*) centre of pressure
(*c*) metacentre
(*d*) centre of buoyancy
(*e*) in between c.g. and centre of pressure.

8.175. The centre of gravity of the volume of the liquid displaced by an immersed body is called
(*a*) centre of gravity
(*b*) centre of pressure
(*c*) metacentre
(*d*) centre of buoyancy
(*e*) centroid.

8.176. Differential monometer is used to measure
(*a*) pressure in pipes, channels etc.
(*b*) atmospheric pressure
(*c*) very low pressure
(*d*) difference of pressure between two points
(*e*) velocity in pipes

8.177. The pressure in the air space above an oil (sp. gr. 0.8) surface in a tank is 0.1 kg/cm^2. The pressure at 2.5 m below the oil surface will be
(*a*) 2 metres of water column
(*b*) 3 metres of water column
(*c*) 3.5 metres of water column
(*d*) 4 m of water column
(*e*) none of the above.

8.178. The time oscillation of a floating body with increase in metacentric height will be
(*a*) same (*b*) higher
(*c*) lower
(*d*) lower/higher depending on weight of body
(*e*) unpredictable.

8.179. In an immersed body, centre of pressure is
(*a*) at the centre of gravity
(*b*) above the centre of gravity
(*c*) below be centre of gravity
(*d*) could be above or below c.g. depending on density of body and liquid
(*e*) unpredictable.

8.180. The normal stress is same in all directions at a point in a fluid
(*a*) only when the fluid is frictionless
(*b*) only when the fluid is incompressible and has zero viscosity
(*c*) when there is no motion of one fluid layer relative to an adjacent layer
(*d*) irrespective of the motion of one fluid layer relative to an adjacent layer
(*e*) in case of an ideal fluid.

8.181. Select the correct statement
(*a*) Local atmospheric pressure depends upon elevation of locality only
(*b*) Standard atmospheric pressure is the mean local atmospheric pressure at sea level
(*c*) Local atmospheric pressure is always below standard atmospheric pressure
(*d*) A barometer reads the difference between local and standard atmospheric pressure
(*e*) Gauge pressure is equal to atmospheric pressure plus instrument reading.

8.182. Gauge pressure is equal to
(*a*) absolute pressure + atmospheric pressure
(*b*) absolute pressure - atmospheric pressure
(*c*) atmospheric pressure - absolute pressure
(*d*) atmospheric pressure - vacuum
(*e*) atmospheric pressure + vacuum.

8.183. The equation of continuity of flow is based on the principle of conservation of
(*a*) flow (*b*) mass

(c) momentum (d) energy
(e) mass, momentum and energy.

8.184. For measuring flow by a venturimeter, it should be installed in
(a) vertical line (b) horizontal line
(c) inclined line with flow downward
(d) inclined line with upward flow
(e) in any direction and in any location.

8.185. Total pressure on a 1 m × 1 m gate immersed vertically at a depth of 2 m below the free water surface will be
(a) 1000 kg (b) 4000 kg
(c) 2000 kg (d) 8000 kg
(e) 16000 kg.

8.186. Hot wire anemometer is used to measure
(a) pressure in gases
(b) liquid discharge
(c) pressure in liquids
(d) gas velocities
(e) temperature.

8.187. Rotameter is a device used to measure
(a) absolute pressure
(b) velocity of fluid
(c) flow (d) rotation
(e) velocity of air.

8.188. Flow of water in a pipe about 3 metres in diameter can be measured by
(a) orifice plate (b) venturi
(c) rotameter (d) pitot tube
(e) nozzle

8.189. True one-dimensional flow occurs when
(a) the direction and magnitude of the velocity at all points are identical
(b) the velocity of successive fluid particles, at any point, is the same at successive periods of time
(c) the magnitude and direction of the velocity do not change from point to point in the fluid
(d) the fluid particles move in plane or parallel planes and the streamline patterns are identical in each plane
(e) velocity, depth, pressure etc. change from point to point in the fluid flow.

8.190. An ideal flow of any fluid must satisfy
(a) Pascal law
(b) Newton's law of viscosity
(c) boundary layer theory
(d) continuity equation
(e) Bernoulli's theorem.

8.191. In the case of steady flow of a fluid, the acceleration of any fluid particle is
(a) constant (b) variable
(c) zero
(d) zero under limiting conditions
(e) never zero.

8.192. The depth of centre of pressure in a rectangular lamina of height h with one side in the liquid surface is at
(a) h (b) $\frac{h}{3}$
(c) $\frac{2h}{3}$ (d) $\frac{h}{2}$
(e) $\frac{3}{4}h$.

8.193. Non uniform flow occurs when
(a) the direction and magnitude of the velocity at all points are identical
(b) the velocity of successive fluid particles, at any point, is the same at successive periods of time
(c) the magnitude and direction of the velocity do not change from point to point in the fluid
(d) the fluid particles move in plane or parallel planes and the streamline patterns are identical in each plane
(e) velocity, depth, pressure, etc. change from point to point in the fluid flow.

8.194. During the opening of a valve in a pipe line, the flow is
(a) steady (b) unsteady
(c) uniform (d) laminar
(e) free vortex type.

8.195. Uniform flow occurs when
(a) the flow is steady
(b) the flow is streamline
(c) size and shape of the cross section in a particular length remain constant
(d) size and cross section change uniformly along length
(e) flow occurs at constant rate.

8.196. Gradually varied flow is
(a) steady uniform
(b) non-steady non-uniform
(c) non-steady uniform
(d) steady non-uniform
(e) true one-dimensional.

8.197. Steady flow occurs when
(*a*) the direction and magnitude of the velocity at all points are identical
(*b*) the velocity of successive fluid particles, at any point, is the same at successive periods of time
(*c*) the magnitude and direction of the velocity do not change from point to point in the fluid
(*d*) the fluid particles move in plane or parallel planes and the streamline patterns are identical in each plane
(*e*) velocity, depth, pressure, etc. change from point to point in the fluid flow.

8.198. The flow which neglects changes in a transverse direction is known as
(*a*) one dimensional flow
(*b*) uniform flow
(*c*) steady flow
(*d*) turbulent flow
(*e*) streamline flow.

8.199. The flow in which each liquid particle has a definite path and their paths do not cross each other is called
(*a*) one dimensional flow
(*b*) uniform flow
(*c*) steady flow
(*d*) turbulent flow
(*e*) streamline flow.

8.200. The flow in which conditions do not change with time at any point, is known as
(*a*) one dimensional flow
(*b*) uniform flow
(*c*) steady flow
(*d*) turbulent flow
(*e*) streamline flow.

8.201. The flow in which the velocity vector is identical in magnitude and direction at every point, for any given instant, is known as
(*a*) one dimensional flow
(*b*) uniform flow
(*c*) steady flow
(*d*) turbulent flow
(*e*) streamline flow.

8.202. The flow in which the particles of a fluid attain such velocities that vary from point to point in magnitude and direction as well as from instant to instant, is known as
(*a*) one dimensional flow
(*b*) uniform flow
(*c*) steady flow
(*d*) turbulent flow
(*e*) streamline flow.

8.203. Which of the following is Chezy's formula for determining flow in open channel
(*a*) $v = \frac{1}{n} m^{2/3} i^{1/2}$ (*b*) $v = C\sqrt{mi}$
(*c*) $v = \dfrac{157.6}{1.81 + \frac{K}{\sqrt{m}}}\sqrt{mi}$
(*d*) $v = \dfrac{23 + \frac{0.00155}{i} + \frac{1}{n}}{1 + \left(23 + \frac{0.00155}{i}\right)\frac{n}{\sqrt{m}}}\sqrt{mi}$
(*e*) none of the above.
where v = mean velocity of flow,
i = slope of channel,
m = hydraulic mean depth,
C, n, and K are constants.

8.204. Venturimeter is used to measure flow of fluids in pipes when pipe is
(*a*) horizontal
(*b*) vertical, flow downwards
(*c*) vertical, flow upwards
(*d*) inclined position
(*e*) in any position.

8.205. Which of the following is the Manning's formula for determining flow in open channel
(*a*) $v = \frac{1}{n} m^{2/3} i^{1/2}$ (*b*) $v = C\sqrt{mi}$
(*c*) $v = \dfrac{157.6}{1.81 + \frac{K}{\sqrt{m}}}\sqrt{mi}$
(*d*) $v = \dfrac{23 + \frac{0.00155}{i} + \frac{1}{n}}{1 + \left(23 + \frac{0.00155}{i}\right)\frac{n}{\sqrt{m}}}\sqrt{mi}$
(*e*) none of the above.
where v = mean velocity of flow,
i = slope of channel,
m = hydraulic mean depth,
C, n, and K are constants.

8.206. The length of divergent portion of venturimeter in comparison to convergent portion is
(*a*) same (*b*) more
(*c*) less

(*d*) more or less depending on capacity
(*e*) no correlation.

8.207. Which of the following is the Darcy or Weisbach equation

(*a*) $v = \frac{1}{n} m^{2/3} i^{1/2}$ (*b*) $v = C\sqrt{mi}$

(*c*) $v = \frac{157.6}{1.81 + \frac{K}{\sqrt{m}}} \sqrt{mi}$

(*d*) $v = \frac{23 + \frac{0.00155}{i} + \frac{1}{n}}{1 + \left(23 + \frac{0.00155}{i}\right)\frac{n}{\sqrt{m}}} \sqrt{mi}$

(*e*) none of the above.

where v = mean velocity of flow,
i = slope of channel,
m = hydraulic mean depth,
C, n, and K are constants.

8.208. Which of the following is Bazin's formula

(*a*) $v = \frac{1}{n} m^{2/3} i^{1/2}$ (*b*) $v = C\sqrt{mi}$

(*c*) $v = \frac{157.6}{1.81 + \frac{K}{\sqrt{m}}} \sqrt{mi}$

(*d*) $v = \frac{23 + \frac{0.00155}{i} + \frac{1}{n}}{1 + \left(23 + \frac{0.00155}{i}\right)\frac{n}{\sqrt{m}}} \sqrt{mi}$

(*e*) none of the above.

where v = mean velocity of flow,
i = slope of channel,
m = hydraulic mean depth,
C, n, and K are constants.

8.209. Which of the following is Kutter's formula

(*a*) $v = \frac{1}{n} m^{2/3} i^{1/2}$ (*b*) $v = C\sqrt{mi}$

(*c*) $v = \frac{157.6}{1.81 + \frac{K}{\sqrt{m}}} \sqrt{mi}$

(*d*) $v = \frac{23 + \frac{0.00155}{i} + \frac{1}{n}}{1 + \left(23 + \frac{0.00155}{i}\right)\frac{n}{\sqrt{m}}} \sqrt{mi}$

(*e*) none of the above.

where v = mean velocity of flow,
i = slope of channel,
m = hydraulic mean depth,
C, n, and K are constants.

8.210. Flow occurring in a pipeline when a valve is being opened is
(*a*) steady (*b*) unsteady
(*c*) laminar (*d*) vortex
(*e*) rotational.

8.211. General energy equation holds for
(*a*) steady flow (*b*) turbulent flow
(*c*) laminar flow (*d*) non-uniform flow
(*e*) all of the above.

8.212. A streamline is defined as the line
(*a*) parallel to central axis flow
(*b*) parallel to outer surface of pipe
(*c*) of equal velocity in a flow
(*d*) along which the pressure drop is uniform
(*e*) which occurs in all flows.

8.213. Two dimensional flow occurs when
(*a*) the direction and magnitude of the velocity at all points are identical
(*b*) the velocity of successive fluid particles, at any point, is the same at successive periods of time
(*c*) the magnitude and direction of the velocity do not change from point to point in the fluid
(*d*) the fluid particles move in plane or parallel planes and the streamline patterns are identical in each plane
(*e*) velocity, depth, pressure, etc. change from point to point in the fluid flow.

8.214. In case of rectangular lamina with side in liquid surface having depth h, the depth of centre of pressure will be
(*a*) $\frac{2h}{3}$ (*b*) $\frac{h}{2}$
(*c*) $\frac{3h}{4}$ (*d*) $\frac{h}{3}$
(*e*) $\frac{3h}{8}$

8.215. A piece of metal of specific gravity 7 floats in mercury of specific gravity 13.6. What fraction of its volume is under mercury ?
(*a*) 0.5 (*b*) 0.4
(*c*) 0.515 (*d*) 0.5
(*e*) none of the above.

8.216. A piece of wood having weight 5 kg floats in water with 60% of its volume under the liquid. The specific gravity of wood is
(*a*) 0.83 (*b*) 0.6

(*c*) 0.4 (*d*) 0.3
(*e*) none of the above.

8.217. Three vessels of inverted pyramid, semi-spherical, V-trough shapes having same volume and same height are to be emptied by an equal area opening. Times for emptying in order will be
(*a*) semi-sphere, inverted pyramid, V-trough
(*b*) inverted pyramid, semi-sphere, V-trough
(*c*) inverted pyramid, V-trough, semi-phere
(*d*) semi-sphere, V-trough, inverted pyramid
(*e*) V-trough, semi-sphere, inverted pyramid.

8.218. The velocity of jet of water travelling out of opening in a tank filled with water is proportional to
(*a*) head of water (h)
(*b*) h^2 (*c*) $\sqrt{h}$
(*d*) h^3 (*e*) $h^{3/2}$.

8.219. In a free vortex motion, the radial component of velocity everywhere is
(*a*) maximum (*b*) minimum
(*c*) zero
(*d*) non-zero and finite
(*e*) unpredictable.

8.220. In a forced vortex, the velocity of flow everywhere within the fluid is
(*a*) maximum (*b*) minimum
(*c*) zero (*d*) non-zero finite
(*e*) unpredictable.

8.221. The region between the separation streamline and the boundary surface of the solid body is known as
(*a*) wake (*b*) drag
(*c*) lift (*d*) boundary layer
(*e*) aerofoil section.

8.222. For hypersonic flow, the Mach number is
(*a*) unity (*b*) greater than unity
(*c*) greater than 2 (*d*) greater than 4
(*e*) greater than 10.

8.223. The upper surface of a weir over which water flows is known is
(*a*) crest (*b*) nappe
(*c*) sill (*d*) weir top
(*e*) contracta.

8.224. Normal depth in open channel flow is the depth of flow corresponding to
(*a*) steady flow (*b*) unsteady flow
(*c*) laminar flow (*d*) uniform flow
(*e*) critical flow.

8.225. Velocity distribution in the turbulent boundary layer follows following law
(*a*) linear (*b*) square
(*c*) parabola (*d*) logarithmic
(*e*) cubic.

8.226. Uniform flow occurs when
(*a*) the direction and magnitude of the velocity at all points are identical
(*b*) the velocity of successive fluid particles, at any point, is the same at successive periods of time
(*c*) the magnitude and direction of the velocity do not change from point to point in the fluid
(*d*) the fluid particles move in plane or parallel planes and the streamline patterns are identical in each plane
(*e*) velocity, depth, pressure, etc. change from point to point in the fluid flow.

8.227. Pitot tube is used for measurement of
(*a*) pressure (*b*) flow
(*c*) velocity (*d*) dsscharge
(*e*) viscosity.

8.228. Hydrometer is used to determine
(*a*) specific gravity of liquids
(*b*) specific gravity of solids
(*c*) specific gravity of gases
(*d*) relative humidity
(*e*) density.

8.229. The total energy of each particle at various places in the case of perfect incompressible fluid flowing in continuous sream
(*a*) keeps on increasing
(*b*) keeps on decreasing
(*c*) remains constant
(*d*) may increase/decrease
(*e*) unpredictable.

8.230. According to Bernoulli's equation for steady ideal fluid flow
(*a*) principle of conservation of mass holds
(*b*) velocity and pressure are inversely proportional
(*c*) total energy is constant throughout

(*d*) the energy is constant along a streamline but may vary across streamlines
(*e*) none of the above.

8.231. The equation of continuity holds good when the flow
(*a*) is steady
(*b*) is one dimensional
(*c*) velocity is uniform at all the cross sections
(*d*) all of the above
(*e*) none of the above.

8.232. Mach number is significant in
(*a*) supersonics, as with projectiles and jet propulsion
(*b*) full immersion or completely enclosed flow, as with pipes, aircraft wings, nozzles etc.
(*c*) simultaneous motion through two fluids where there is a surface of discontinuity, gravity force, and wave making effects, as with ship's hulls
(*d*) all of the above
(*e*) none of the above.

8.233. Froude number is significant in
(*a*) supersonics, as with projectile and jet propulsion
(*b*) full immersion or completely enclosed flow, as with pipes, aircraft wings, nozzles etc.
(*c*) simultaneous motion through two fluids where there is a surface of discontinuity, gravity forces, and wave making effect, as with ship's hulls
(*d*) all of the above
(*e*) none of the above

8.234. All the terms of energy in Bernoulli's equation have dimension of
(*a*) energy (*b*) work
(*c*) mass (*d*) length
(*e*) time.

8.235. Reynolds number is significant in
(*a*) supersonics, as with projectile and jet propulsion
(*b*) full immersion or completely enclosed flow, as with pipes, aircraft wings, nozzles etc.
(*c*) simultaneous motion through two fluids where there is a surface of discontinuity, gravity forces, and wave making effect, as with ship's hulls
(*d*) all of the above
(*e*) none of the above.

8.236. The fluid forces considered in the Navier Stokes equation are
(*a*) gravity, pressure and viscous
(*b*) gravity, pressure and turbulent
(*c*) pressure, viscous and turbulent
(*d*) gravity, viscous and turbulent
(*e*) none of the above.

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(*c*) simultaneous motion through two fluids where there is a surface of discontinuity, gravity forces, and wave making effect, as with ship's hulls
(*d*) all of the above
(*e*) none of the above.

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(*a*) gravity, pressure and viscous
(*b*) gravity, pressure and turbulent
(*c*) pressure, viscous and turbulent
(*d*) gravity, viscous and turbulent
(*e*) none of the above.

8.237. A large Roynold number is indication of
(*a*) smooth and streamline flow
(*b*) laminar flow
(*c*) steady flow
(*d*) turbulent flow
(*e*) highly turbulent flow.

8.238. The friction head lost due to the flow of a viscous fluid through a circular pipe of length *L* and diameter *d* with a velocity *v*, and pipe friction factor '*f*' is
(*a*) $\frac{4fL}{d}\cdot\frac{v^2}{2g}$ (*b*) $\frac{4fL}{\pi d^2}\cdot\frac{v^2}{2g}$
(*c*) $\frac{4fL}{\frac{v^2}{2g}}$ (*d*) $\frac{4fL}{\pi d}\cdot\frac{v^2}{2g}$
(*e*) none of the above.

8.239. For pipes, laminar flow occurs when Roynolds number is
(*a*) less than 2000
(*b*) between 2000 and 4000
(*c*) more than 4000
(*d*) less than 4000
(*e*) none of the above.

8.240. In order that flow takes place between two points in a pipeline, the differential pressure between these points must be more than
(*a*) frictional force
(*b*) viscosity
(*c*) surface friction
(*d*) all of the above
(*e*) none of the above.

8.241. At the centre line of a pipe flowing under pressure where the velocity gradient is zero, the shear stress will be
(*a*) minimum (*b*) maximum
(*c*) zero (*d*) negative value
(*e*) could be any value.

8.242. The pressure in Pascals at a depth of 1 m below the free surface of a body of water will be equal to
(*a*) 1 Pa (*b*) 98.1Pa
(*c*) 981 Pa (*d*) 9810 Pa
(*e*) 98,100 Pa.

8.243. The expression for relation between the gauge pressure p inside a liquid droplet (i.e. difference of pressure between the inside and outside of a liquid drop) of diameter d and the surface tension σ is
(*a*) $\sigma = pd$ (*b*) $\sigma = \pi pd$
(*c*) $\sigma = \frac{pd}{\pi}$ (*d*) $\sigma = 4pd$
(*e*) $\sigma = \frac{pd}{4}$.

8.244. Two pipe systems can be said to be equivalent, when the following quantites are same
(*a*) friction loss and flow
(*b*) length and diameter
(*c*) flow and length
(*d*) friction factor and diameter
(*e*) velocity and diameter.

8.245. For pipes, turbulent flow occurs when Reynolds number is
(*a*) less than 2000
(*b*) between 2000 and 4000
(*c*) more than 4000
(*d*) less than 4000
(*e*) none of the above.

8.246. Bernoulli equation deals with the law of conservation of
(*a*) mass (*b*) momentum
(*c*) energy (*d*) work
(*e*) force.

8.247. A hydraulic press has a ram of 15 cm diameter and plunger of 1.5 cm. It is required to lift a weight of 1 tonne. The force required on plunger is equal to
(*a*) 10 kg (*b*) 100 kg
(*c*) 1000 kg (*d*) 1 kg
(*e*) 10,000 kg.

8.248. Cavitation is caused by
(*a*) high velocity (*b*) high pressure
(*c*) weak material (*d*) low pressure
(*e*) low viscosity.

8.249. Cavitation will begin when
(*a*) the pressure at any location reaches an absolute pressure equal to the saturated vapour pressure of the liquid
(*b*) pressure becomes more than critical pressure
(*c*) flow is increased
(*d*) pressure is increased
(*e*) none of the above.

8.250. Principle of similitude forms the basis of
(*a*) comparing two identical equipments
(*b*) designing models so that the result can be converted to prototypes
(*c*) comparing similarity between design and actual equipment
(*d*) hydraulic designs
(*e*) performing acceptance tests.

8.251. For similarity, in addition to models being geometrically similar to prototype, the following in both cases should also be equal
(*a*) ratio of inertial force to force due to viscosity
(*b*) ratio of inertial force to force due to gravitation
(*c*) ratio of inertial force to force due to surface tension
(*d*) all the four ratios of inertial force to force due to viscosity, gravitation, surface tension, and elasticity

(e) none of the above.

8.252. If V is the mean velocity of flow, then according to Darcy-Weisbach equation for pipe flow, energy loss over a length of pipe line is proportional to
(a) V (b) $\frac{1}{V}$
(c) V^2 (d) $\frac{1}{V^2}$
(e) $\sqrt{V}$.

8.253. Froude number is the ratio of inertial force to
(a) gravitation force
(b) surface tension
(c) elasticity
(d) viscosity
(e) none of the above.

8.254. The non-dimensional factor governing viscous or frictional resistance is
(a) Reynolds number
(b) Weber number
(c) Froude number
(d) Mach number
(e) none of the above.

8.255. Euler's dimensionless number relates
(a) pressure force and inertia force
(b) pressure force and viscous force
(c) inertia force and gravity force
(d) buoyancy force and viscous force
(e) inertia force and viscous force.

8.256. The rate of change of linear momentum equals
(a) active force (b) reactive force
(c) torque (d) work done
(e) power.

8.257. Mach number is the ratio of inertial force to
(a) gravitation force
(b) surface tension
(c) elasticity
(d) viscosity
(e) none of the above.

8.258. Mach number greater than unity implies that the flow is
(a) sonic (b) subsonic
(c) supersonic
(d) hypersonic
(e) associated with shocks.

8.259. The component of the force of the fluid on the body (which is generally inclined to the direction of motion of the body) parallel to the direction of motion is called
(a) drag (b) lift
(c) wake (d) propelling force
(e) thrust.

8.260. The rate of change of moment of momentum represents the
(a) force exerted by fluid
(b) torque applied by the fluid
(c) work done by the fluid
(d) power developed by the fluid
(e) none of the above.

8.261. Reynolds number is the ratio of intertial force to
(a) gravitational force
(b) surface tension
(c) elasticity (d) viscosity
(e) none of the above.

8.262. The energy loss in flow through nozzle as compared to venturimeter is
(a) same (b) more
(c) less
(d) more/less depending on flow
(e) unpredictable.

8.263. Weber number is the ratio of intertial force to
(a) gravitational force
(b) surface tension
(c) elasticity (d) viscosity
(e) none of the above.

8.264. Pressure coefficient is the ratio of pressure force to
(a) inertia force (b) gravity force
(c) viscous force (d) surface tension
(e) elasticity.

8.265. The pressure coefficient may take the form
(a) $\Delta P/\sigma\mu v$ (b) $\Delta P/(\sigma v^2/2)$
(c) $\Delta P/\frac{\mu^2 r^4}{\sigma}$ (d) $\frac{\sigma\mu^2}{2\Delta P}$
(e) none of the above.

8.266. Separation of flow occurs when pressure gradient
(a) tends to approach zero
(b) becomes negative
(c) changes abruptly
(d) reduces to a value when vapour formation starts

(*e*) does not follow continuity equation.

8.267. In laminar flow friction resistance is dependent on
(*a*) area of surface in contact
(*b*) (area of surface in contact)^2
(*c*) $\sqrt{\text{area of surface in contact}}$
(*d*) (area of surface in contact)$^{3/2}$
(*e*) none of the above.

8.268. Darcy-Weisabach equation for loss of head in pipe is
(*a*) $f\frac{L}{4m}\cdot\frac{V^2}{2g}$ (*b*) $f\frac{L}{m}\frac{V^2}{2g}$
(*c*) $f\frac{4L}{m}\frac{V^2}{2g}$ (*d*) $f\frac{4m}{L}\frac{V^2}{2g}$
(*e*) $f\frac{m}{4L}\frac{V^2}{2g}$.
where f = friction factor, L = length, V = velocity
$m = \frac{A}{P}$ = area/wetted perimeter
m = hydraulic radius.

8.269. Which of the following is not a dimensionless parameter
(*a*) Reynolds number
(*b*) friction factor
(*c*) pressure coefficient
(*d*) kinematic viscosity
(*e*) all of the above.

8.270. When a boundary layer leaves a surface and curves up into a vortex or whirloop, it is known as
(*a*) drag (*b*) wake
(*c*) cavitation (*d*) separation
(*e*) boundary layer separation.

8.271. A dimensionless combination of $\Delta P, \rho, l, Q$ is
(*a*) $\sqrt{\frac{\Delta P}{\rho}\frac{Q}{l^2}}$ (*b*) $\sqrt{\frac{\rho}{\Delta P}\frac{Q}{l^2}}$
(*c*) $\frac{\Delta P l Q}{\rho}$ (*d*) $\frac{\rho Q}{\Delta P l^2}$
(*e*) none of the above.

8.272. Orifice is an opening
(*a*) with closed perimeter and of regular form through which water flows
(*b*) with prolonged sides having length of 2 to 3 diameters of opening in thick wall
(*c*) with partially full flow
(*d*) in hydraulic structure with regulation provision
(*e*) none of the above.

8.273. The average value of coefficient of velocity is of the order of
(*a*) 0.56 (*b*) 0.68
(*c*) 0.78 (*d*) 0.89
(*e*) 0.97.

8.274. The coefficients of discharge, velocity and contraction C_d, C_v, and C_c are related as
(*a*) $C_d = C_v + C_c$ (*b*) $C_d = C_v - C_c$
(*c*) $C_d = C_c - C_v$ (*d*) $C_d = C_c/C_v$
(*e*) $C_d = C_c \times C_v$.

8.275. The actual velocity at vena contracta for flow through an orifice from a reservior of height H=
(*a*) $\sqrt{2gH}$ (*b*) $C_v\sqrt{2gH}$
(*c*) $\sqrt{2gH/C_v}$ (*d*) $C_d\sqrt{2gH}$
(*e*) $C_d/\sqrt{2gH}$.

8.276. The ratio of actual discharge to theoretical discharge through an orifice is
(*a*) C_c/D_d (*b*) C_d/C_v.
(*c*) C_d/C_v (*d*) C_cC_v
(*e*) C_vC_d.

8.277. The value of coefficient of discharge in comparison to coefficient of velocity is
(*a*) more (*b*) less
(*c*) same
(*d*) more/less depending on flow
(*e*) unpredictable.

8.278. For frictionless fluid, the contraction coefficient for Borda's mouthpiece is
(*a*) 1 (*b*) 0.5
(*c*) 0 (*d*) 0.97
(*e*) 0.8

8.279. A mouthpiece can't be used under very large head because of
(*a*) creation of vortex at vena contracta
(*b*) cavitation problem at vena contracta
(*c*) large variation of discharge
(*d*) erratic flow
(*e*) contraction becomes too high.

8.280. A fluid jet discharging from a 100 mm diameter orifice has a diameter 80 mm at its vena contracta. The coefficient of contraction is
(*a*) 0.8 (*b*) 1.25

(*c*) 0.2 (*d*) 0.64
(*e*) 0.36.

8.281. In order that no shock wave develops when flow is taking place through a converging diverging tube, Mach number at exit should be
(*a*) = 1 (*b*) < 1
(*c*) > 1 (*d*) not critical
(*e*) there is no such criterion.

8.282. Weir in an opening
(*a*) with closed perimeter and of regular form through which water flows
(*b*) with prolonged sides having length of 2 to 3 diameters of opening in thick wall
(*c*) with partially full flow
(*d*) in hydraulic structure with regulation provision
(*e*) none of the above.

8.283. The region downstream from the streamline where separation takes place from the boundary is known as
(*a*) wake (*b*) lift
(*c*) drag (*d*) cavitation
(*e*) boundary layer separation.

8.284. Choose the wrong statement about flow nets
(*a*) flow nets are drawn to indicate flow patterns in case of one dimensional flow
(*b*) flow net consists of a system of streamlines so spaced that the rate of flow is the same between each successive pair of lines
(*c*) flow net consists of another system of lines normal to the streamlines and so spaced that the distance between the normal lines equals the distance between adjacent streamlines
(*d*) an infinite number of streamlines are required to describe completely the flow under given boundary condition
(*e*) It is usual practice to use a small number of such streamlines, as long as acceptable accuracy is obtained.

8.285. Continuity equation for a compressible fluid is
(*a*) $A_1V_1 = A_2V_2$
(*b*) $\rho_1A_1V_1 = \rho_2A_2V_2$ (A = area)
(*c*) $\frac{A_1V_1}{\rho_1} = \frac{A_2V_2}{\rho_2}$ (V = velocity)
(*d*) $\frac{\rho_1A_1}{V_1} = \frac{\rho_2A_2}{V_2}$ (ρ = density)
(*e*) $\frac{\rho_1V_1}{A_1} = \frac{\rho_1V_2}{A_2}$.

8.286. The continuity equation
(*a*) is based on Bernoulli's theorem
(*b*) expresses relation between work and energy
(*c*) expresses relation between hydraulic parameters of flow
(*d*) relates the mass rate of flow along a streamline
(*e*) is used to determine flow by pitot tube.

8.287. Equation of continuity of flow is based on the principle of conservation of
(*a*) mass (*b*) force
(*c*) momentum (*d*) energy
(*e*) hydraulic pressure.

8.288. Bernoulli's theorem deals with the conservation of
(*a*) mass (*b*) force
(*c*) momentum (*d*) energy
(*e*) hydraulic pressure.

8.289. The drag coefficient for laminar flow varies as proportional to
(*a*) Re (*b*) Re^{-1}
(*c*) $Re^{1/2}$ (*d*) $Re^{-1/2}$
(*e*) $Re^{3/2}$
(where Re = Reynolds number).

8.290. Continuity equation for an incompressible fluid is
(*a*) $A_1V_1 = A_2V_2$
(*b*) $\rho_1A_1V_1 = \rho_2A_2V_2$ (A = area)
(*c*) $\frac{A_1V_1}{\rho_1} = \frac{A_2V_2}{\rho_2}$ (V = velocity, ρ = density)
(*d*) $\frac{\rho_1A_1}{V_1} = \frac{\rho_2A_2}{V_2}$
(*e*) $\frac{\rho_1V_1}{A_1} = \frac{\rho_1V_2}{A_2}$.

8.291. For maximum discharge through a circular open channel, the ratio of depth of flow to diameter of channel should be
(*a*) 0.9 (*b*) 0.5

(*c*) 0.65 (*d*) 0.85
(*e*) 0.95.

8.292. An air vessel is usually provided at the summit of a syphon in order to
(*a*) regulate the flow
(*b*) increase discharge
(*c*) avoid interruption in flow
(*d*) increase velocity
(*e*) increase height of syphon.

8.293. The flow at critical depth in an open channel is
(*a*) maximum (*b*) minimum
(*c*) zero
(*d*) half of normal flow
(*e*) critical.

8.294. Tube is an opening
(*a*) with closed perimeter and of regular form through which water flows
(*b*) with prolonged sides having length of 2–3 diameters of opening in thick wall
(*c*) with partially full flow
(*d*) in hydraulic structure with regulation provision
(*e*) none of the above.

8.295. Highest efficiency is obtained with following channel section
(*a*) circular (*b*) triangular
(*c*) rectangular (*d*) quadrant
(*e*) trapezoidal.

8.296. For best hydraulic rectangular cross-section of an open channel, its depth should be equal to
(*a*) width (*b*) 2 width
(*c*) $\frac{\text{width}}{2}$ (*d*) $\sqrt{\text{width}}$
(*e*) $\frac{3}{8}$ width.

8.297. A triangular section in open channel flow will be most economical when the vertex angle at the triangle base point is
(*a*) 30° (*b*) 45°
(*c*) 60° (*d*) 90°
(*e*) 120°.

8.298. The discharge over a V-notch weir is proportional to
(*a*) $h^{3/2}$ (*b*) $h^{5/2}$
(*c*) $h^{1/2}$ (*d*) $h^{-3/2}$
(*e*) $h^{-5/2}$

8.299. The motion of a fluid is vortex if each particle of the fluid moves in a circular path with the speed which
(*a*) is constant
(*b*) is directly proportional to distance from centre
(*c*) varies as square of distance from centre
(*d*) varies inversely as the distance from centre
(*e*) varies inversely as square of distance from centre.

8.300. Time required to empty uniform rectangular tank is proportional to its
(*a*) height H (*b*) $\sqrt{H}$
(*c*) H^2 (*d*) $H^{3/2}$
(*e*) $\frac{1}{\sqrt{H}}$.

8.301. The laminar sub-layer acts as
(*a*) an insulating medium
(*b*) good conductor of heat
(*c*) refractory substance
(*d*) heat absorber
(*e*) heat generator.

8.302. A mouth-piece can't be used for emptying tanks with large heads because
(*a*) cavitation occurs at vena contracta
(*b*) vortex is created at vena contracta
(*c*) variation in discharge is high
(*d*) flow-through mouth piece is erratic
(*e*) flow becomes turbulent.

8.303. Gate is an opening
(*a*) with closed perimeter and of regular form through which water flows
(*b*) with prolonged sides having length of 2–3 diameters of opening in thick wall
(*c*) with partially full flow
(*d*) in hydraulic structure with regulation provision
(*e*) none of the above.

8.304. The value of coefficient of velocity for a sharp edged orifice is of the order of
(*a*) 0.45 (*b*) 0.5
(*c*) 0.62 (*d*) 0.78
(*e*) 0.98.

8.305. The value of coefficient of velocity depends upon
(*a*) slope of orifice
(*b*) size of orifice

(c) head of liquid above orifice
(d) type of orifice
(e) friction at the orifice surface.

8.306. The contraction of area for flow through orifice in tank depends on
(a) shape of orifice
(b) size of orifice
(c) head in tank
(d) all of the above
(e) none of the above.

8.307. In an external mouthpiece, value of coefficient of discharge, if pipe is flowing full, will be
(a) 0.602 (b) 0.75
(c) 0.86 (d) 0.98
(e) 1.0.

8.308. The horizontal component of force on a curved surface is equal to the
(a) product of pressure at its centroid and area
(b) weight of liquid retained by the curved area
(c) force on a vertical projection of the curved surface
(d) weight of liquid vertically above the curved surface
(e) none of the above.

8.309. The vertical component of pressure force on a submerged curved surface is equal to
(a) weight of liquid vertically above the curved surface and extending upon the free surface
(b) the force on a vertical projection of the curved surface
(c) the product of pressure at centroid and surface area
(d) horizontal component
(e) none of the above.

8.310. A block of ice floating over water in a vessel slowly melts in it. The water level in the vessel will
(a) start rising
(b) start falling
(c) will remain constant
(d) will depend on temperature in water
(e) be unpredictable.

8.311. Manning formula is used to determine
(a) head loss due to friction in pipes flowing full under pressure
(b) head loss due to friction in open channels
(c) flow in open channels
(d) flow in pipes
(e) pressure in open channels.

8.312. The hydraulic radius in the case of an open channel with great width is equal to
(a) depth of channel
(b) 1/2 × depth of channel
(c) 1/3 × depth of channel
(d) 1/4 × depth of channel
(e) 3/8 × depth of channel.

8.313. In open channel corresponding to critical depth, the discharge is
(a) maximum (b) minimum
(c) zero flow (d) turbulent flow
(e) most economical.

8.314. If a water tank partially filled with water is being carried on a truck moving with a constant-horizontal acceleration, the level of the liquid will
(a) rise on the front side of the tank
(b) fall on the back side of the tank
(c) remain the same at both the sides of the tank
(d) rise on the back side and fall on the front side
(e) unpredictable.

8.315. The discharge over a sharp-edged rectangular notch of width w and depth h is equal to
(a) $\frac{2}{3} C_d w\sqrt{2g}\, h^{5/2}$ (b) $\frac{2}{3} C_d w \sqrt{2g}\, h$
(c) $\frac{2}{3} C_d w \sqrt{2g}\, h^{3/2}$
(d) $\frac{8}{15} C_d w \sqrt{2g}\, h^{3/2}$
(e) $\frac{8}{15} C_d w \sqrt{2g}\, h^{5/2}$.

8.316. The discharge through an orifice fitted in a tank can be increased by
(a) fitting a short length of pipe to the outside
(b) sharpening the edges of orifice
(c) fitting a long length of pipe to the outside
(d) fitting a long length of pipe to the inside
(e) all of the above.

8.317. When the depth of water in an open channel is greater than the critical depth then flow is said to be
(*a*) critical (*b*) turbulent
(*c*) torrential (*d*) tranquil
(*e*) sub-critical.

8.318. When the depth of water in an open channel is less than the critical depth, then flow is said to be
(*a*) critical (*b*) turbulent
(*c*) torrential (*d*) tranquil
(*e*) sub-critical.

8.319. The hydraulic grade line is
(*a*) always moving up
(*b*) always moving down
(*c*) always above the energy grade line
(*d*) the velocity head below the energy grade line
(*e*) none of the above.

8.320. The rise of liquid along the walls of a revolving cylinder above the initial level
(*a*) is greater than the depression of the liquid at the axis of rotation
(*b*) is lesser than the depression of the liquid at the axis of rotation
(*c*) is the same as the depression of the liquid at the axis of rotation
(*d*) it depends upon the magnitude of speed
(*e*) none of the above.

8.321. When a liquid rotates at constant angular velocity about a vertical axis as a rigid body, the pressure
(*a*) increases linearly as its radial distance
(*b*) varies inversely as the altitude along any vertical line
(*c*) varies as the square of the radial distance
(*d*) decreases as the square of radial distance
(*e*) none of the above.

8.322. Total pressure on the top of a closed cylindrical vessel completely filled with liquid, is directly proportional to
(*a*) radius (*b*) $(\text{radius})^2$
(*c*) $(\text{radius})^3$ (*d*) $(\text{radius})^4$
(*e*) none of the above.

8.323. If the particles of a fluid attain such velocities that velocities vary from point to point in magnitude and direction, as well as from instant to instant, the flow is said to be
(*a*) disturbed flow (*b*) turbulent flow
(*c*) turbid flow (*d*) non-uniform flow
(*e*) non-steady flow.

8.324. The included angle of triangular notch for maximum discharge is
(*a*) 45° (*b*) 60°
(*c*) 90° (*d*) 108°
(*e*) 120°.

8.325. Most efficient channel section is
(*a*) half hexagon in form of trapezoid
(*b*) triangular (*c*) rectangular
(*d*) semi-circular (*e*) none of the above.

8.326. The discharge through a rectangular-notch weir varies as
(*a*) $H^{-1/2}$ (*b*) $H^{1/2}$
(*c*) $H^{3/2}$ (*d*) $H^{5/2}$
(*e*) H^2.

8.327. The discharge over a sharp-edge triangular notch having included angle of 2θ and depth of h is given by the formula
(*a*) $\frac{2}{3} C_d \sqrt{2g} \tan\theta\, h^{3/2}$
(*b*) $\frac{8}{15} C_d \sqrt{2g} \tan\theta\, h^{3/2}$
(*c*) $\frac{2}{3} C_d \sqrt{2g} \tan\theta\, h^{5/2}$
(*d*) $\frac{8}{15} C_d \sqrt{2g} \tan\theta\, h^{5/2}$
(*e*) none of the above.

8.328. The discharge in a Sultro weir varies as proportional to
(*a*) H (*b*) $H^{3/2}$
(*c*) $\sqrt{H}$ (*d*) H^2
(*e*) $H^{5/2}$.

8.329. The discharge through a semi-circular weir is proportional
(*a*) $H^{-1/2}$ (*b*) $H^{1/2}$
(*c*) $H^{3/2}$ (*d*) $H^{5/2}$
(*e*) H^2.

8.330. Critical-depth metre is used to measure
(*a*) discharge in an open channel
(*b*) hydraulic jump
(*c*) depth of flow in channel
(*d*) depth of channel

(e) none of the above.

8.331. If flow in an open channel is gradually varied, then the flow will be
(a) steady uniform flow
(b) unsteady uniform flow
(c) steady non-uniform flow
(d) unsteady non-uniform flow
(e) none of the above.

8.332. The width of the weir with end contraction is
(a) less than the width of channel
(b) more than the width of channel
(c) equal to width of channel
(d) half the width of channel
(e) twice the width of channel.

8.333. The function of surge tank is to
(a) relieve the pipe line of excessive pressure produced by water hammer
(b) smoothen flow
(c) act as reservoir for emergency conditions
(d) avoid reverse flow
(e) supply water at constant pressure.

8.334. The discharge of broad crested weir is maximum if the head of water on the downstream side of weir as compared to the head on the upstream side of the weir is
(a) one-half
(b) one-third
(c) two-third
(d) three-fourth
(e) two-fifth.

8.335. The cipoletti weir functions as if it were a following notch without end contractions
(a) triangular notch
(b) trapezoidal notch
(c) rectangular notch
(d) parallelogram notch
(e) none of the above.

8.336. Maximum discharge over broad crested weir is
(a) $1.71\, C_d L.H^{3/2}$ (b) $1.71\, C_d L.H^{5/2}$
(c) $1.71\, C_d L.H^{1/2}$ (d) $0.384\, C_d L\, H^{3/2}$
(e) $0.384\, C_d L.H^{5/2}$.

8.337. Cipoletti notch is designed as trapezoid with its sides sloping at 1 horizontal and
(a) 1 vertical (b) 2 vertical
(c) 3 vertical (d) 4 vertical
(e) 5 vertical.

8.338. In series-pipe applications
(a) the head losses through each pipe are added to obtain the total head loss
(b) the head loss is same through each pipe
(c) friction factors are assumed for each pipe
(d) flow increases
(e) none of the above.

8.339. Choking in pipe flow implies
(a) no flow occurs
(b) negative flow takes place due to water hammer
(c) valve in pipline is closed
(d) the specified mass flow can't occur
(e) no flow due to heavy pressure loss.

8.340. In the case of flow through parallel pipes
(a) flow in each pipe is same
(b) head loss in each pipe is same
(c) head loss depends upon flow conditions
(d) total head loss is sum of the head losses in individual pipes
(e) none of the above.

8.341. For a laminar flow
(a) flow occurs in a zig zag way
(b) Reynolds number lies between 2000 to 3000 for pipes
(c) Newton's law of viscosity is of importance
(d) pipe losses are major considerations
(e) velocity of flow is maximum.

8.342. The most economical section of circular channel for maximum discharge is obtained when
(a) depth of water = 0.95 d
(b) wetted perimeter = 2.6 d
(c) hydraulic mean depth = 0.29 d
(d) any one of the above
(e) none of the above
(d = dia. of circular section).

8.343. The flow in venturiflume takes place at
(a) atmospheric pressure
(b) at pressure greater than atmospheric pressure
(c) vacuum (d) high pressure
(e) any pressure.

8.344. Hydraulic diameter used in place of diameter for non-circular ducts is equal to
(*a*) A/m (*b*) $4\,A/m$
(*c*) $A/4\,m$ (*d*) m/A
(*e*) $4\,m/A$.
where A = area of flow and m = perimeter

8.345. Any fluid flow follows
(*a*) Bernoulli's equation
(*b*) Newton's law of viscosity
(*c*) Darcy's equation
(*d*) continuity equation
(*e*) all of the above.

8.346. The velocity distribution in the turbulent boundary layer follows
(*a*) straight line law
(*b*) parabolic law (*c*) hyperbolic law
(*d*) logarithmic law
(*e*) quadratic law.

8.347. Laminar flow occurs in pipes, when Reynolds number
(*a*) lies between 2000—3000
(*b*) lies between 3000—4000
(*c*) is more than 2000
(*d*) is less than 2000
(*e*) none of the above.

8.348. Which of the following pipe bends will introduce maximum head loss
(*a*) 30° bend (*b*) U-bend
(*c*) 60° bend (*d*) 90° bend
(*e*) 45° bend.

8.349. In pipes larger than 25 mm, carrying water, the laminar flow
(*a*) very often exists
(*b*) generally exists
(*c*) rarely exists
(*d*) unpredictable
(*e*) none of the above.

8.350. The path of jet discharging from bottom opening in a tank full of water will be
(*a*) horizontal straight line
(*b*) linearly downward
(*c*) approximately hyperbola
(*d*) parabola with its vertex at the opening
(*e*) none of the above.

8.351. Borda's mouthpiece is
(*a*) a short cylindrical tube projecting inward, having length of 1/2 diameter
(*b*) a convergent tube having length of 2—3 diameters
(*c*) most commonly used
(*d*) rarely used
(*e*) none of the above.

8.352. A hydraulic ram acts like
(*a*) a centrifugal pump
(*b*) a rotary pump
(*c*) a reciprocating pump
(*d*) an impulse pump
(*e*) cylinder pump.

8.353. Hydraulic ram is a device used
(*a*) to accelerate water flow
(*b*) lift water without electric motor
(*c*) for lifting heavy load
(*d*) beat water and lift it
(*e*) measure flow in rivers.

8.354. The discharge through a syphon spillway is equal to $C_d \times a \times \sqrt{2g} \times \ldots$
(*a*) $\sqrt{H}$ (*b*) H
(*c*) $H^{3/2}$ (*d*) $H^{5/2}$
(*e*) H^2.

8.355. An air vessel is provided at the summit in the syphon in order to
(*a*) maintain pressure difference
(*b*) increase discharge
(*c*) increase velocity
(*d*) control pressure variations
(*e*) avoid interruption in the flow.

8.356. A fluid flow taking place continuously round a curved path about a fixed axis of rotation. is known as
(*a*) rotational flow (*b*) radial flow
(*c*) circular flow (*d*) unsteady flow
(*e*) vortex flow.

8.357. When a liquid rotates at constant angular velocity about a vertical axis as a rigid body, the pressure
(*a*) varies as the square of the radial distance
(*b*) decreases as the square of the radial distance
(*c*) increases linearly as the radial distance
(*d*) varies inversely as the elevation along any vertical line
(*e*) is zero throughout.

8.358. In a free vortex motion
(*a*) rotation of fluid, moving as a solid, takes place about an axis

(b) each particle moves in a circular path with a speed varying inversely as the distance from the centre
(c) velocity decreases with the radius
(d) velocity remains constant
(e) none of the above.

8.359. The critical velocity as
(a) maximum attainable velocity
(b) terminal velocity
(c) velocity when hydraulic jump occurs
(d) velocity above which the flow ceases to be streamlined
(e) velocity at which flow is maximum.

8.360. The rise of liquid along the walls of a revolving cylinder as compared to depression at the centre w.r.t. initial level is
(a) same (b) more
(c) less
(d) more/less depending on speed
(e) unpredictable.

8.361. In a forced-vortex motion
(a) rotation of fluid, moving as a solid, takes place about an axis
(b) each particle moves in a circular path with a speed varying inversely as the distance from the centre
(c) velocity decreases with the radius
(d) velocity remains constant
(e) none of the above.

8.362. When a fluid flows in concentric circles, it is known as
(a) free circular motion
(b) free rotational motion
(c) free spiral vortex flow
(d) free cylindrical vortex flow
(e) radial flow.

8.363. In a free vortex motion, the tangential velocity of the water particles is proportional to
(a) distance from the centre (r)
(b) r^2 (c) $1/r$
(d) $\frac{1}{r^2}$ (e) $\frac{1}{\sqrt{r}}$

8.364. A right-circular cylinder open at top is filled with water and rotated about its vertical axis at such speed that half the liquid spills out. The pressure at centre of bottom is
(a) one half its value when cylinder was full
(b) one fourth its value when cylinder was full
(c) zero
(d) can't be determined due to insufficient data
(e) none of the above.

8.365. An ideal fluid is
(a) similar to perfect gas
(b) one which obeys Newton's law of viscosity
(c) frictionless and incompressible
(d) very viscous (e) does not exist.

8.366. The total pressure on the top of a closed cylindrical vessel of radius r filled with liquid is proportional to
(a) r (b) $\frac{1}{r}$
(c) $\frac{1}{r^2}$ (d) r^2
(e) $\frac{1}{\sqrt{r}}$.

8.367. The general equation of continuity for three dimensional flow of a compressible fluid for steady flow is
(a) $\frac{\partial u}{\partial x}+\frac{\partial v}{\partial y}+\frac{\partial w}{\partial z}=0$
(u, v and w are components of velocity in x, y and z direction).
(b) $\frac{\partial u}{\partial x}=\frac{\partial v}{\partial y}=\frac{\partial w}{\partial z}=0$
(c) $\frac{\partial u}{\partial x}+\frac{\partial v}{\partial y}+\frac{\partial w}{\partial x}=1$
(d) $\frac{\partial u}{\partial x}+\frac{\partial v}{\partial y}+\frac{\partial w}{\partial z}=u.v.w.$
(e) none of the above.

8.368. Reynolds number for non-circular cross section is
(a) $\frac{V\cdot 4P}{\nu}$ (b) $\frac{V\cdot P}{\nu}$
(c) $\frac{V\cdot 2P}{4\nu}$ (d) $\frac{V\cdot P}{4\nu}$
(e) $\frac{VP}{2\nu}$.
[V = mean velocity
ν = kinematic viscosity
P = Ratio of cross sectional area to the wetted perimeter]

8.369. If a mouthpiece is running full at the outlet, the vacuum created at vena-contracta
(*a*) increases velocity of jet
(*b*) decreases velocity of jet
(*c*) decreases the discharge
(*d*) decreases the value of coefficient of contraction
(*e*) does not affect the velocity of jet.

8.370. Vertical distribution of velocity in an open channel for laminar flow can be assumed as
(*a*) logarithmic (*b*) parabolic
(*c*) straight line (constant)
(*d*) hyperbolic (*e*) none of the above.

8.371. Vertical distribution of velocity in an open channel for turbulent flow can be assumed as
(*a*) logarithmic (*b*) parabolic
(*c*) straight line (constant)
(*d*) hyperbolic (*e*) none of the above.

8.372. The most economical channel section is one for which the following parameter is maximum for a given cross sectional area
(*a*) velocity (*b*) discharge
(*c*) depth (*d*) wetted perimeter
(*e*) hydraulic radius.

8.373. The most economical section of a rectangular channel for maximum discharge is obtained when its depth is equal to
(*a*) half the breadth
(*b*) twice the breadth
(*c*) same as the breadth
(*d*) $\frac{3}{4}$th the breadth
(*e*) one third the breadth.

8.374. One dimensional flow is
(*a*) restricted to flow in a straight line
(*b*) uniform flow
(*c*) one which neglects changes in a transverse direction
(*d*) the most general flow
(*e*) none of the above.

8.375. Euler's equation for motion of liquids is based on the assumption that the
(*a*) flow is streamline
(*b*) flow takes place continuously
(*c*) flow is homogeneous and incompressible
(*d*) flow is turbulent
(*e*) flow is irrotational.

8.376. Euler's equation in the differential form for motion of liquids is given by
(*a*) $\frac{dp}{\rho} - gdz + vdv = 0$
(*b*) $\frac{dp}{\rho} + gdz - gdz = 0$
(*c*) $\frac{dp}{\rho} + gdz + vdv = 0$
(*d*) $\rho dp + gdz + vdv = 0$
(*e*) none of the above.

8.377. For an irrotational flow, $\frac{\delta^2\phi}{\delta x^2} + \frac{\delta^2\phi}{\delta y^2} = 0$ is the equation given by
(*a*) Cauchy-Riemann
(*b*) Reynolds (*c*) Laplace
(*d*) Bernoulli (*e*) Manning.

8.378. If u, v, w are the components of the velocity v of a moving particle, then the equation $\frac{u}{dx} = \frac{v}{dy} = \frac{w}{dz}$ represents an equation of
(*a*) one dimensional flow
(*b*) two dimentional flow
(*c*) three dimensional flow
(*d*) multi demensional flow
(*e*) none of the above.

8.379. In case of a two dimensional flow the components of velocity are given by $u = ax$; $v = by$, the streamlines will consist of a series of
(*a*) circular arcs (*b*) parabolic arcs
(*c*) hyperbolic arcs
(*d*) elliptical arcs (*e*) none of the above.

8.380. In case of a two dimensional flow, if the components of vcelocity are given by $u = ax$; $v = by$, the point where no motion occurs, is known as
(*a*) critical point
(*b*) neutral point
(*c*) stagnation point
(*d*) stationary point
(*e*) none of the above.

8.381. For pipe flows, at constant head, capacity is proportional to
(*a*) (pipe dia) ^{2} (*b*) (pipe dia) $^{2.5}$
(*c*) pipe dia (*d*) (pipe dia) ^{3}
(*e*) 1/pipe dia.

8.382. For pipe flows, at constant capacity, head is proportional to
(*a*) $1/d$ (*b*) $1/d^2$
(*c*) $1/d^3$ (*d*) $1/d^5$
(*e*) $1/d^4$.
(where d = pipe diameter).

8.383. 10 m of water column is equal to
(*a*) 10 kN/m^2 (*b*) 1 kN/m^2
(*c*) 100 kN/m^2 (*d*) 0.1 kN/m^2
(*e*) none of the above.

8.384. As pump speed increases, its NPSH (net positive suction head) requirement
(*a*) increases (*b*) decreases
(*c*) remains unaffected
(*d*) may increase/decrease depending on other considerations
(*e*) none of the above.

8.385. For pipe flows, at constant diameter, head is proportional to
(*a*) flow (*b*) (flow)^2
(*c*) (flow)^3 (*d*) 1/flow
(*e*) 1/flow^2.

8.386. For pipe flow, at constant diameter, capacity is proportional to
(*a*) $\sqrt{\text{head}}$ (*b*) head
(*c*) head$^{3/2}$ (*d*) head^2
(*e*) $1/\sqrt{\text{head}}$.

8.387. The pressure in pipes for fluids flowing is proportional to
(*a*) $\frac{1}{\text{inside diameter of pipe}(d)}$
(*b*) $\frac{1}{d^2}$ (*c*) $\frac{1}{d^3}$
(*d*) $\frac{1}{d^3}$ (*e*) $\frac{1}{d^5}$.

8.388. Friction factor for pipes depends on
(*a*) rate of flow (*b*) fluid density
(*c*) viscosity (*d*) pipe roughness
(*e*) all of the above.

8.389. In order to replace a compound pipe by a new pipe, the pipes will be equivalent when following are same for both the pipes
(*a*) length and flow
(*b*) diameter and flow
(*c*) loss of head and flow
(*d*) length and loss of head
(*e*) loss of head and velocity.

8.390. The head loss in case of hot water flow through a pipe compared to cold water flow will be
(*a*) same
(*b*) more
(*c*) less
(*d*) more or less depending on range of temperatures
(*e*) unpredictable.

8.391. The frictional resistance of a pipe varies approximately as
(*a*) velocity of flow (v)
(*b*) v^2 (*c*) $\sqrt{v}$
(*d*) $v^{3/2}$. (*e*) $v^{5/2}$

8.392. According to Darcy's formula, loss of head due to friction in the pipe is
(*a*) $\frac{4flv^2}{gd}$ (*b*) $\frac{flv^2}{gd}$
(*c*) $\frac{2flv^2}{gd}$ (*d*) $\frac{4flv}{gd}$
(*e*) $\frac{4flv^2}{d}$
where f = Darcy's coefficient,
l = length of pipe,
v = velocity of liquid flow,
d = diameter of pipe.

8.393. If d = diameter of nozzle, D = diameter of pipe, l = length of pipe and f = Darcy's coefficient of friction for pipe, then for maximum power transmission of power, d should be equal to
(*a*) $\left(\frac{D^5}{8fl}\right)^{1/4}$ (*b*) $\left(\frac{D^5}{8fl}\right)^{1/2}$
(*c*) $\left(\frac{D^5}{8fl}\right)^{1/3}$ (*d*) $\left(\frac{D^5}{8fl}\right)^{3/4}$
(*e*) $\left(\frac{D^5}{8fl}\right)^{2/5}$

8.394. To replace a pipe of diameter D by n parallel pipes of diameter d, the formula used is
(*a*) $d = \frac{D}{n}$ (*b*) $d = \frac{D}{n^{1/2}}$
(*c*) $d = \frac{D}{n^{3/2}}$ (*d*) $d = \frac{D}{n^{2/5}}$
(*e*) $d = \frac{D}{n^{2/3}}$.

8.395. For a flow to be rotational, the velocity normal to the plane of area should be equal to the
(*a*) angular velocity vector
(*b*) half the angular velocity vector
(*c*) twice the angular velocity vector
(*d*) zero
(*e*) maximum.

8.396. Head loss in a flowing fluid is experienced due to
(*a*) friction at surface
(*b*) change of direction
(*c*) change of section of passage
(*d*) obstruction in passage
(*e*) all of the above.

8.397. Loss of head due to friction in a pipe of uniform is diameter with viscous flow is equal to
(*a*) Reynolds number (Re)
(*b*) 1/Re (*c*) 4/Re
(*d*) 16/Re (*e*) 64/Re.

8.398. Power transmitted through a pipe is maximum when the loss of head due to friction is
(*a*) one-half of the total head supplied
(*b*) one-third of the total head supplied
(*c*) one-fourth of the total head supplied
(*d*) equal to the total head supplied
(*e*) zero.

8.399. If l_1, l_2, l_3 etc. be the lengths and d_1, d_2, d_3, etc. be the diameters of the parts of a compound pipe, then length L and diameter D of a uniform equivalent pipe will be related as under
(*a*) $\frac{L}{D} = \frac{l_1}{d_1} + \frac{l_2}{d_2} + \frac{l_3}{d_3} + \ldots$
(*b*) $\frac{L}{D^2} = \frac{l_1}{d_1^2} + \frac{l_2}{d_2^2} + \frac{l_3}{d_3^2} + \ldots$
(*c*) $\frac{L}{D^3} = \frac{l_1}{d_1^3} + \frac{l_2}{d_2^3} + \frac{l_3}{d_3^3} + \ldots$
(*d*) $\frac{L}{D^4} = \frac{l_1}{d_1^4} + \frac{l_2}{d_2^4} + \frac{l_3}{d_3^4} + \ldots$
(*e*) $\frac{L}{D^5} = \frac{l_1}{d_1^5} + \frac{l_2}{d_2^5} + \frac{l_3}{d_3^5} + \ldots$

8.400. Time of flow from one tank in which water level is h_1 to another tank having level h_2 will be proportional to
(*a*) $h_1 - h_2$ (*b*) $\sqrt{h_1 - h_2}$
(*c*) $\sqrt{h_1} - \sqrt{h_2}$ (*d*) $\frac{1}{\sqrt{h_1} - \sqrt{h_2}}$
(*e*) $h_1^{3/2} - h_2^{3/2}$.

8.401. Maximum efficiency of transmission of power through a pipe is
(*a*) 25% (*b*) 33.3%
(*c*) 50% (*d*) 66.6%
(*e*) 100%.

8.402. If the pressure at the inlet of a pipe is 90 kg/cm^2 and the pressure drop over the pipe line is 10 kg/cm^2, the efficiency of transmission is
(*a*) 66.6% (*b*) 77.7%
(*c*) 55.5% (*d*) 88.8%
(*e*) 44.4%

8.403. The hydraulic mean depth for a circular pipe of diameter '*d*' running full is equal to
(*a*) d (*b*) $\frac{d}{3}$
(*c*) $\frac{d}{2}$ (*d*) $\frac{d}{4}$
(*e*) $\frac{d}{5}$.

8.404. Hydraulic gradient is equal to
(*a*) $\frac{\text{difference in water surface}}{\text{total length of channel}}$
(*b*) $\frac{\text{head loss due to friction}}{\text{total length of channel}}$
(*c*) $\frac{\text{wetted perimeter}}{\text{total length of channel}}$
(*d*) $\frac{\text{area of cross-section}}{\text{total length of channel}}$
(*e*) none of the above.

8.405. The total frictional resistance to fluid flow is independent of
(*a*) density of fluid
(*b*) velocity (*c*) pressure
(*d*) surface roughness
(*e*) area of wetted surface.

8.406. The ratio of the hydraulic radius of a pipe running full of water to the hydraulic radius of a square section of a channel whose side is equal to the diameter of the pipe, is
(*a*) 1 (*b*) $\frac{1}{2}$

(c) $\frac{1}{3}$ (d) $\frac{3}{4}$
(e) none of the above.

8.407. Velocity of pressure waves due to pressure disturbances imposed in a fluid is equal to
(a) $\sqrt{\frac{\text{Bulk Modulus}(E)}{\text{density}(\rho)}}$
(b) $\sqrt{E\rho}$ (c) $\sqrt{\rho/E}$
(d) $\sqrt{1/\rho E}$ (e) none of the above.

8.408. The velocity of fluid particle at the centre of pipe section is
(a) zero (b) minimum
(c) maximum
(d) average of full section
(e) some value in between minimum and maximum.

8.409. Steady flow occurs when
(a) conditions change steadily with time
(b) conditions do not change with time at any point
(c) conditions are same at adjacent points with time
(d) velocity vector at any point remains constant
(e) none of the above.

8.410. Uniform flow occurs when
(a) at every point the velocity vector is identical, in magnitude and direction, for any given instant
(b) the flow is steady
(c) discharge through a pipe is constant
(d) conditions do not change with time at any point
(e) none of the above.

8.411. Which of the following represents steady uniform flow
(a) flow through an expanding tube at an increasing rate
(b) flow through an expanding tube at constant rate
(c) flow through a long pipe at decreasing rate
(d) flow through a long pipe at constant rate
(e) none of the above.

8.412. In the case of turbulent flow
(a) it occurs in open channel
(b) losses are proportional to square of velocity
(c) velocity at boundary is zero
(d) it is not possible to measure flow
(e) shear stresses are more compared to laminar flow.

8.413. For a siphon to work satisfactorily, the minimum pressure in the pipe as compared to vapour pressure of liquid should be
(a) more (b) less
(c) equal (d) could be anything
(e) unpredictable.

8.414. Water hammer in pipes occurs due to
(a) someone hitting the pipe with a hammer
(b) sudden change in the velocity of any flowing fluid
(c) heavy pressurisation of pipe
(d) obstruction in pipe
(e) none of the above.

8.415. If a liquid in a pipe suddenly undergoes a change in velocity by ΔV and if ρ is density of liquid and c is the velocity of pressure wave or speed of sound in liquid, then change in pressure experienced equals
(a) $\rho c/\Delta v$ (b) $-\Delta v/\rho c$
(c) $-\rho\Delta v/c$ (d) $-\rho/c\Delta v$
(e) none of the above.

8.416. Which of the following represents unsteady non-uniform flow
(a) flow through an expanding tube at an increasing rate
(b) flow through an expanding tube at constant rate
(c) flow through a long pipe at decreasing rate
(d) flow through a long pipe at constant rate
(e) none of the above.

8.417. Critical depth of a channel is equal to
(a) $\frac{v^2}{g}$ (b) $\frac{v^2}{2g}$
(c) $\frac{v^2}{4g}$ (d) $v \times g$
(e) $v^2 \times g$.

8.418. In a short cylindrical external mouthpiece, the vena-contracta occurs at a place which is at a distance equal to
(a) diameter of the orifice from the outlet of orifice

(b) one-fourth the diameter of the orifice from the outlet of orifice
(c) one-third the diameter of the orifice from the outlet of orifice
(d) two-third the diameter of the orifice from the outlet of orifice
(e) none of the above.

8.419. Fire hose nozzle is generally made of
(a) divergent shape
(b) convergent shape
(c) convergent-divergent shape
(d) cylindrical shape
(e) parabolic shape.

8.420. Chezy's equation is used to determine
(a) velocity of flow in open channel
(b) velocity of flow in pipe
(c) flow over weirs
(d) discharge through notch
(e) flow through mouthpiece.

8.421. Equation of continuity results from the principal of conservation of
(a) energy (b) flow
(c) mass (d) momentum
(e) entropy.

8.422. Hydraulic grade line for any flow system as compared to energy line is
(a) above (b) below
(c) at same level
(d) may be below or above depending upon velocity of flow
(e) none of the above.

8.423. Which curve in Fig. 8.4 shows the correct nature of distribution of stress at a cross section in a horizontal circular pipe under steady flow conditions ?
(a) curve A (b) curve B
(c) curve C (d) curve D
(e) none of the above.

8.424. The magnitude of water hammer depends on
(a) length of pipe
(b) elastic properties of pipe material
(c) rate of stoppage of flow
(d) all of the above
(e) none of the above.

8.425. The magnitude of water hammer does not depend upon
(a) temperature of fluid
(b) length of pipe
(c) elastic properties of pipe material
(d) time of valve closure
(e) rate of stoppage of flow.

8.426. Which of the following represents unsteady uniform flow
(a) flow through an expanding tube at an increasing rate
(b) flow through an expanding tube at constant rate
(c) flow through a long pipe at decreasing rate
(d) flow through a long pipe at constant rate
(e) all of the above.

8.427. A weir in which the downstream water level of the weir nappe is higher than the crest, is called
(a) submerged weir
(b) overflowing weir
(c) broadcrested wear
(d) cipoletti weir (e) ogee weir.

8.428. Discharge through a totally submerged orifice is directly proportional to
(a) the difference in elevation of water surface
(b) the square root of the difference in elevation of water surface
(c) the square root of the area of the opening
(d) reciprocal of the area of the opening
(e) none of the above.

8.429. The upper surface of the weir over which water flows, is known as
(a) vein (b) nappe
(c) sill (d) weir top surface
(e) none of the above.

8.430. Which of the following represents steady non-uniform flow
(a) flow through an expanding tube at an increasing rate
(b) flow through an expanding tube at constant rate
(c) flow through a long pipe at decreasing rate
(d) flow through a long pipe at a constant rate
(e) none of the above.

8.431. Drag is defined as the force component exerted on an immersed object, the component acting in direction

(*a*) normal to flow direction
(*b*) parallel to flow direction
(*c*) at resultant angle
(*d*) radial to flow direction
(*e*) opposite to flow direction.

8.432. Pressure drag as per boundary layer theory is function of
(*a*) shape of body
(*b*) dimensions of body
(*c*) flow direction
(*d*) separation of flow
(*e*) shape of body and separation of flow.

8.433. Profile drag is equal to
(*a*) friction drag – pressure drag
(*b*) pressure drag – friction drag
(*c*) pressure drag + friction drag
(*d*) pressure drag × friction drag
(*e*) $\frac{\text{pressure drag + friction drag}}{2}$

8.434. Bluff body is the body of such a shape that pressure drag as compared to friction drag is
(*a*) same (*b*) more
(*c*) less (*d*) zero
(*e*) negligible.

8.435. A body is said to be provided optimum amount of streamlining when
(*a*) friction drag is minimum
(*b*) pressure drag is minimum
(*c*) profile drag (*i.e.*, sum of friction drag and pressure drag) is minimum
(*d*) product of friction and pressure drag is minimum
(*e*) friction drag is minimum and pressure drag is maximum.

8.436. The flow of any fluid, real or ideal, must fulfill the following
(*a*) Newton's law of viscosity
(*b*) Newton's second law of viscosity
(*c*) Velocity at boundary must be zero relative to the boundary
(*d*) the continuity equation
(*e*) none of the above.

8.437. Turbulent flow generally occurs for cases involving
(*a*) very slow motions
(*b*) very viscous fluids
(*c*) very narrow passages
(*d*) all of the above
(*e*) none of the above.

8.438. In turbulent flow
(*a*) the shear stresses are generally larger than in a similar laminar flow
(*b*) fluid particles move in an orderly manner
(*c*) momentum transfer is on a molecular scale only
(*d*) cohesion is more effective than momentum transfer in causing shear stress
(*e*) none of the above.

8.439. In laminar flow
(*a*) the velocity is of no consideration
(*b*) Newton's law of viscosity applies
(*c*) losses are proportional to square of velocity
(*d*) generally occurs in practice
(*e*) rarely occurs.

8.440. Continuity equation can take the form
(*a*) $Q = pVv$ (*b*) $\rho_1 A_1 = \rho_2 A_2$
(*c*) $A_2 v_1 = A_2 v_2$ (*d*) $p_1 A_1 v_1 = p_2 A_2 v_2$
(*e*) all of the above.

8.441. The continuity equation
(*a*) requires that Newton's second law of motion be satisfied at every point in fluid
(*b*) relates the momentum per unit volume for two points on a streamline
(*c*) expresses the relation between energy and work
(*d*) relates mass rate of flow along a streamline
(*e*) none of the above.

8.442. Continuity equation relates
(*a*) conservation of mass and momentum
(*b*) energy and work
(*c*) frictional losses
(*d*) mass rate of flow along a streamline
(*e*) shear stress in turbulent flow.

8.443. The continuity equation in fluid flow
(*a*) states that energy is constant along a streamline
(*b*) states that energy is constant every where in the fluid
(*c*) applies to irrotational flow only
(*d*) states that the net rate of inflow into small volume must be zero
(*e*) none of the above.

8.444. Head loss in turbulent flow in a pipe
(*a*) varies directly as velocity
(*b*) varies inversely as square of velocity
(*c*) varies approximately as square of velocity
(*d*) depends upon orientation of pipe
(*e*) varies inversely as velocity.

8.445. The losses in open channel vary as proportional to
(*a*) velocity (V) (*b*) V^2
(*c*) $\sqrt{V}$ (*d*) V^3
(*e*) $\frac{1}{\sqrt{V}}$.

8.446. The losses due to sudden expansion are expressed by
(*a*) $\frac{V_1^2 - V_2^2}{2g}$ (*b*) $\frac{V_2^2 - V_1^2}{2g}$
(*c*) $\frac{(V_1 - V_2)^2}{g}$ (*d*) $\frac{(V_1 - V_2)^2}{2g}$
(*e*) $\frac{0.5V_1^2}{2g}$

8.447. The losses due to sudden contraction are expressed by
(*a*) $\frac{V_1^2 - V_2^2}{2g}$ (*b*) $\frac{V_2^2 - V_1^2}{2g}$
(*c*) $\frac{(V_1 - V_2)^2}{g}$ (*d*) $\frac{(V_1 - V_2)^2}{2g}$
(*e*) $\frac{0.5V_1^2}{2g}$.

8.448. The depth of water below the spillway and after hydraulic jump are 1 m and 6 m respectively. The head lost will be
(*a*) 1.04 m (*b*) 5 m
(*c*) 1.7 m (*d*) 2.05 m
(*e*) none of the above.

8.449. The velocity distribution for flow between two fixed parallel plates
(*a*) it constant over the cross-section
(*b*) is zero at the plates and increases linearly to the midplane
(*c*) varies parabolically across the section
(*d*) is zero in middle and increases linearly towards the plates
(*e*) none of these.

8.450. Bernoulli's theorem is applicable for
(*a*) streamline flow
(*b*) steady flow (*c*) turbulent flow
(*d*) normal flow
(*e*) perfect incompressible fluid flowing in continuous streams.

8.451. The shear stress in a fluid flowing in a round pipe
(*a*) is constant over the cross-section
(*b*) is zero at the wall and increases linearly to the centre
(*c*) is zero at centre and varies linearly with radius
(*d*) varies parabolically across the section
(*e*) unpredictable.

8.452. Which one is the correct statement
(*a*) Hydraulic grade line should always be above the centre line of conduit
(*b*) Hydraulic grade line should always be below the centre line of conduit
(*c*) Hydraulic grade line should always the parallel to the centre line of conduit
(*d*) Hydraulic grade line may be above or below the centre line of conduit
(*e*) none of the above.

8.453. A liquid jet from a nozzle exposed to atmosphere traverses along
(*a*) a straight line (*b*) a circular path
(*c*) an elliptical path
(*d*) parabolic path (*e*) hyperbolic path.

8.454. In laminar flow through a round tube, the discharge varies
(*a*) linearly as the viscosity
(*b*) inversely as the pressure drop
(*c*) as the cube of the diameter
(*d*) inversely as the viscosity
(*e*) directly as the static head.

8.455. If ρ is density of fluid, then pressure of fluid due to water hammer is directly proportional to
(*a*) ρ (*b*) $\frac{1}{\sqrt{\rho}}$
(*c*) $\sqrt{\rho}$ (*d*) ρ^2
(*e*) $\frac{1}{\rho^2}$.

8.456. The magnitude of rise of pressure due to water hammer in a rigid and non-elastic pipe carrying water of density ρ and bulk modules k will be equal to

(a) $\sqrt{\frac{k}{\rho}}$ (b) $\sqrt{k\rho}$

(c) $\sqrt{\frac{\rho}{k}}$ (d) $\frac{k}{\rho}$.

(e) $k\rho$.

8.457. Separation occurs when

(a) the velocity of sound is reached
(b) the boundary layer comes to rest
(c) the cross-section of a channel is reduced
(d) the pressure reaches a minimum
(e) all of the above.

8.458. The value of coefficient of velocity compared to coefficient of discharge

(a) is less (b) is more
(c) has no relation
(d) is same (e) none of the above.

8.459. The hydraulic radius is given by

(a) wetted perimeter divided by area
(b) area divided by square of wetted perimeter
(c) area divided by wetted perimeter
(d) square root of area
(e) none of the above.

8.460. Pick up the correct statement

(a) venturimeter is more accurate than nozzle
(b) nozzle has same accuracy as venturi, but pressure loss is more and the cost is low
(c) pressure loss in both is same
(d) venturimeter has no restriction on availability of straight length
(e) nozzle has no restriction on availability of straight length.

8.461. Rotameter is used to measure

(a) rotation (b) flow
(c) pressure (d) velocity
(e) viscosity.

8.462. The most economical section of a trapezoidal channel for maximum discharge is obtained when

(a) hydraulic depth = half of depth
(b) half of top width = sloping side
(c) length at perpendiculars from centre of top width to bottom and sloping sides are equal
(d) all of the above
(e) none of the above.

8.463. When venturimeter is inclined, then for a given flow it will show

(a) less reading (b) more reading
(c) same reading (d) inaccurate reading
(e) erroneous reading.

9

Hydraulic Machines

9.1. The force exerted by the jet on fixed plate in Fig. 9.1 given below is equal to

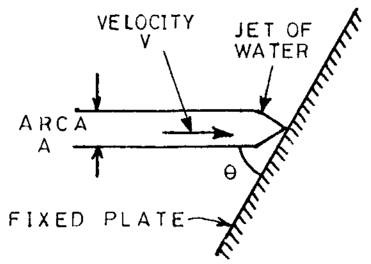

Fig. 9.1.

(*a*) $\frac{AV^2}{g}\sin\theta$. (*b*) $\frac{\rho AV^2}{g}\sin\theta$

(*c*) $\frac{\rho AV^2}{g}\cos\theta$ (*d*) $AV^2\tan\theta$

(*e*) $\frac{AV^2}{g}\cos\theta$.

9.2. If a jet of water of area '*A*' strikes with velocity '*V*' a series of flat plates mounted on a wheel of mean diameter *D* rotating at *N* rpm, then force exerted will be equal to

(*a*) $\frac{\rho AV^2}{g}$ (*b*) $\frac{\rho AV}{g}\left(V-\frac{\pi DN}{60}\right)$

(*c*) $\frac{\rho A}{g}\times\frac{\pi DN}{60}$ (*d*) $\rho A\left(V-\frac{\pi DN}{60}\right)$

(*e*) $\frac{A}{g}\left(V-\frac{\pi DN}{60}\right)$.

9.3. A jet of water enters and leaves a fixed curved vane (of inlet and outlet angles α and β) tangentially. The force of the jet along normal to the vane is

(*a*) $\frac{\rho AV^2}{g}(\cos\alpha+\cos\beta)$

(*b*) $\frac{\rho AV^2}{g}(\cos\alpha-\cos\beta)$

(*c*) $\frac{\rho AV^2}{g}(\sin\alpha+\sin\beta)$

(*d*) $\frac{\rho AV^2}{g}(\sin\alpha-\sin\beta)$

(*e*) $\frac{\rho AV^2}{g}(\tan\alpha-\tan\beta)$.

9.4. A jet of water enters and leaves a moving curved vane, the velocities of whirl at inlet and outlet being V_{w1} and V_{w2}. The force of the jet in the direction of motion of vane is

(*a*) $\frac{\rho AV}{g}(V_{w1}-V_{w2})$

(*b*) $\frac{\rho AV}{g}(V_{w1}+V_{w2})$

(*c*) $\frac{\rho AV^2}{g}(V_{w1}-V_{w2})$

(*d*) $\frac{\rho AV^2}{g}(V_{w1}+V_{w2})$

(*e*) $\frac{\rho}{g}(V_{w1}^2-V_{w1}^2)$.

9.5. The specific speed of a pump is defined as the speed of a unit

(*a*) of such a size that it delivers unit discharge at unit head

(*b*) of such a size that it delivers unit discharge at unit power

(*c*) of such a size that it requires unit power per unit head

(*d*) of such a size that it produces unit horse power with unit head
(*e*) none of the above.

9.6. Reciprocating pumps are no more to be seen in industrial applications (in comparison to centrifugal pumps) because of
(*a*) high initial and maintenance cost
(*b*) lower discharge
(*c*) lower speed of operation
(*d*) necessity of air vessel
(*e*) all of the above.

9.7. In a centrifugal pump casing, the flow of water leaving the impeller, is
(*a*) rectilinear flow
(*b*) radial flow (*c*) free vortex motion
(*d*) forced vortex (*e*) none of the above.

9.8. Head developed by a centrifugal pump depends on
(*a*) impeller diameter
(*b*) speed
(*c*) fluid density
(*d*) type of casing
(*e*) (*a*) and (*b*) above.

9.9. For starting an axial flow pump, its delivery valve should be
(*a*) closed (*b*) open
(*c*) depends on starting condition and flow desired
(*d*) could be either open or closed
(*e*) partly open and partly closed.

9.10. If D is the diameter of impeller at inlet, w is the width of impeller at inlet and V_f is the velocity of flow at inlet, then discharge through a centrifugal pump is equal to
(*a*) $\pi D V_f$ (*b*) $D V_f w$
(*c*) $\pi D V_f w$ (*d*) $\pi D w$
(*e*) $\pi D^2 w V_f$.

9.11. The efficiency of a centrifugal pump is maximum when its blades are
(*a*) straight (*b*) bent forward
(*c*) bent backward
(*d*) bent forward first and then backward
(*e*) bent backward first and then forward.

9.12. In a centrifugal pump casing, the flow of water leaving the
(*a*) radial (*b*) radial
(*c*) centrifugal (*d*) rectilinear
(*e*) vortex.

9.13. A centrifugal pump has following specification
Speed — 1000 r.p.m.
Flow — 1200 l.p.m.
Head — 20 m.
Power — 5 H.P.

If speed is increased to 1500 r.p.m., new flow will be
(*a*) 1800 l.p.m. (*b*) 2700 l.p.m.
(*c*) 1200 l.p.m. (*d*) 4500 l.p.m.
(*e*) none of the above.

9.14. In above example, new h.p. will be
(*a*) 5 H.P. (*b*) 7.5 H.P.
(*c*) 11.25 H.P. (*d*) 16.9 H.P.
(*e*) 22.5 H.P.

9.15. Centrifugal pump is started with its delivery valve
(*a*) kept fully closed
(*b*) kept fully open
(*c*) irrespective of any position
(*d*) kept 50% open
(*e*) none of the above.

9.16. Axial flow pump is started with its delivery valve
(*a*) kept fully closed
(*b*) kept fully open
(*c*) irrespective of any position
(*d*) kept 50% open
(*e*) none of the above.

9.17. When a piping system is made up primarily of vertical lift and very little pipe friction, the pump characteristics should be
(*a*) horizontal (*b*) nearly horizontal
(*c*) steep
(*d*) first rise and then fall
(*e*) none of the above.

9.18. One horsepower is equal to
(*a*) 102 watts (*b*) 75 watts
(*c*) 550 watts (*d*) 735 watts
(*e*) 33000 watts.

9.19. Multistage centrifugal pumps are used to obtain
(*a*) high discharge (*b*) high head
(*c*) pumping of viscous fluids
(*d*) high head and high discharge
(*e*) high efficiency.

9.20. If H is manometric height in metres, Q the discharge in m^3/sec and η the overall efficiency of pump and ρ the density of fluid then power to drive centrifugal pump is equal to

(a) $\frac{\rho QH}{75\eta}$ (b) $\frac{\rho QH\eta}{75}$

(c) $\frac{QH\eta}{75}$ (d) $\frac{QH}{75\eta}$

(e) $\frac{75\rho QH}{\eta}$

9.21. When a piping system is made up primarily of friction head and very little of vertical lift, then pump characteristics should be
(a) horizontal (b) nearly horizontal
(c) steep
(d) first rise and then fall
(e) none of the above.

9.22. In a single casing, multi-stage pump running at constant speed, the capacity rating is to be slightly lowered. It can be done by
(a) designing new impeller
(b) trimming the impeller size to the required size by machining
(c) not possible
(d) some other alterations in the impeller
(e) none of the above.

9.23. Power required to drive a centrifugal pump is proportional to
(a) speed (N) (b) N^2
(c) N^3 (d) N^4
(e) $\frac{1}{N^2}$.

9.24. The percentage slip for a reciprocating pump is defined as the percentage of
(a) actual discharge/theoretical discharge
(b) actual speed/theoretical speed
(c) swept volume/cylinder volume
(d) $\frac{\text{theoretical discharge} - \text{actual discharge}}{\text{theoretical discharge}}$
(e) $\frac{\text{actual discharge} - \text{theoretical discharge}}{\text{actual discharge}}$

9.25. If a pump is handling water and is discharging a certain flow Q at a constant total dynamic head requiring a definite B.H.P., the same pump when handling a liquid of specific gravity 0.75 and viscosity nearly same as of water would discharge
(a) same quantity of liquid
(b) 0.75 Q
(c) Q/0.75
(d) 1.5 Q
(e) none of the above.

9.26. The horse power required in above case will be
(a) same (b) 0.75 B.H.P.
(c) B.H.P./0.75 (d) 1.5 B.H.P.
(e) none of the above.

9.27. Low specific speed of a pump implies it is
(a) centrifugal pump
(b) mixed flow pump
(c) axial flow pump
(d) any one of the above
(e) none of the above.

9.28. Pick up the wrong statement about overall efficiency of a centrifugal pump. It is proportional to
(a) discharge (b) head
(c) B.H.P. (d) $\frac{1}{\text{B.P.H.}}$
(e) discharge and head.

9.29. Fig. 9.2 shows the curves between Head (H) and Flow (Q) for centrifugal pump impeller with different impeller vane exit angles

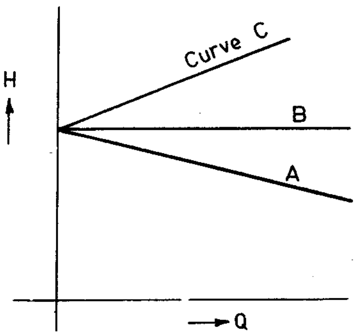

Fig. 9.2.

For vane exit angle of 90°, following curve holds
(a) Curve A (b) Curve B
(c) Curve C (d) all of the above
(e) none of the above.

9.30. For forward inclined vanes *i.e.*, vanes having exit angle greater than 90°, following curve holds good (refer Fig. 9.2)
(a) Curve A (b) Curve B
(c) Curve C (d) all of the above
(e) none of the above.

9.31. Delivery head of a centrifugal pump is proportional to

(*a*) speed (N) (*b*) N^2
(*c*) N^3 (*d*) $\frac{1}{N^2}$
(*e*) $\frac{1}{N^3}$.

9.32. Discharge of a centrifugal pump is proportional to
(*a*) impeller diameter (D)
(*b*) D^2 (*c*) D^3
(*d*) $\frac{1}{D^3}$ (*e*) $\frac{1}{D^2}$.

9.33. Power required to drive a centrifugal pump is proportional to
(*a*) impeller diameter (D)
(*b*) D^2 (*c*) D^3
(*d*) D^4 (*e*) D^6

9.34. For backward inclined vanes, i.e., vane exit angle less than 90°, following curve holds good (refer Fig. 9.2)
(*a*) Curve *A* (*b*) Curve *B*
(*c*) Curve *C* (*d*) all of the above
(*e*) none of the above.

9.35. The optimum value of vane exit angle for a centrifugal pump impeller is
(*a*) 10 – 15° (*b*) 20 – 25°
(*c*) 30 – 40° (*d*) 50 – 60°
(*e*) 80 – 90°.

9.36. In a centrifugal pump, the liquid enters the pump
(*a*) at the top (*b*) at the bottom
(*c*) at the centre (*d*) from sides
(*e*) none of the above.

9.37. For small discharge at high pressure, following pump is preferred
(*a*) centrifugal (*b*) axial flow
(*c*) mixed flow (*d*) propeller
(*e*) reciprocating.

9.38. In centrifugal pumps, maximum efficiency is obtained when the blades are
(*a*) straight (*b*) bent forward
(*c*) bent backward
(*d*) radial
(*e*) given aerofoil section.

9.39. Motion of a liquid in a volute casing of a centrifugal pump is an example of
(*a*) rotational flow (*b*) radial
(*c*) forced spiral vortex flow
(*d*) forced cylindrical vortex flow
(*e*) spiral vortex flow.

9.40. For very high discharge at low pressure such as for flood control and irrigation applications, following type of pump is preferred
(*a*) centrifugal (*b*) axial flow
(*c*) reciprocating (*d*) mixed flow
(*e*) none of the above.

9.41. Medium specific speed of a pump implies it is
(*a*) centrifugal pump
(*b*) mixed flow pump
(*c*) axial flow pump
(*d*) any one of the above
(*e*) none of the above.

9.42. High specific speed of a pump implies it is
(*a*) centrifugal pump
(*b*) mixed flow pump
(*c*) axial flow pump
(*d*) any one of the above
(*e*) none of the above.

9.43. Indicator diagram of a reciprocating pump is a graph between
(*a*) flow vs swept volume
(*b*) pressure in cylinder vs swept volume
(*c*) flow vs speed
(*d*) pressure vs speed
(*e*) swept volume vs speed.

9.44. Low specific speed of turbine implies it is
(*a*) propeller turbine
(*b*) Francis turbine
(*c*) impulse turbine
(*d*) any one of the above
(*e*) none of the above.

9.45. Any change in load is adjusted by adjusting following parameter on turbine
(*a*) net head (*b*) absolute velocity
(*c*) blade velocity (*d*) flow
(*e*) relative velocity of flow at inlet.

9.46. Runaway speed of a hydraulic turbine is
(*a*) full load speed
(*b*) the speed at which turbine runner will be damaged
(*c*) the speed if the turbine runner is allowed to revolve freely without load and with the wicket gates wide open
(*d*) the speed corresponding to maximum overload permissible
(*e*) none of the above.

9.47. The maximum number of jets generally employed in impulse turbine without jet interference is
(*a*) 4 (*b*) 6
(*c*) 8 (*d*) 12
(*e*) 16.

9.48. Medium specific speea of turbine implies it is
(*a*) propeller turbine
(*b*) Francis turbine
(*c*) impulse turbine
(*d*) any one of the above
(*e*) none of the above.

9.49. High specific speed of turbine implies it is
(*a*) propeller turbine
(*b*) Francis turbine
(*c*) impulse turbine
(*d*) any one of the above
(*e*) none of the above.

9.50. The specific speed of turbine is defined as the speed of a unit
(*a*) of such a size that it delivers unit discharge at unit head
(*b*) of such a size that it delivers unit discharge at unit power
(*c*) of such a size that it requires unit power per unit head
(*d*) of such a size that it produces unit horse power with unit head
(*e*) none of the above.

9.51. Puck up the wrong statement about centrifugal pump
(*a*) discharge α diameter
(*b*) head α speed^2
(*c*) head α diameter^2
(*d*) Power α speed^3
(*e*) none of the above is wrong.

9.52. Specific speed of pump is indicated as
(*a*) $\frac{N\sqrt{Q}}{H^{3/4}}$ (*b*) $\frac{N\sqrt{P}}{H^{5/4}}$
(*c*) $\frac{N\sqrt{Q}}{H^{2/3}}$ (*d*) $\frac{N\sqrt{P}}{H^{3/2}}$
(*e*) $\frac{N\sqrt{Q}}{H^{5/4}}$

9,53. For identical pump operation, following ratio is constant
(*a*) disgarge/rpm
(*b*) discharge/head
(*c*) discharge/impeller diameter
(*d*) head/rpm
(*e*) impeller diameter/rpm.

9.54. Fig. 9.3 shows the relationship between power (P) and discharge (Q) for different vane exit angles of centrifugal pump. Curve A holds good for

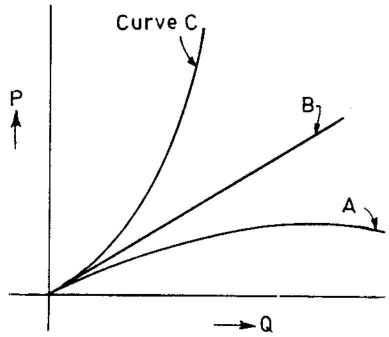

Fig. 9.3.

(*a*) vane exit angle of 90°
(*b*) vane exit angle of less than 90°
(*c*) vane exit angle of more than 90°
(*d*) any vane exit angle
(*e*) none of the above.

9.55. Curve B holds good for (refer Fig. 9.3)
(*a*) vane exit angle of 90°
(*b*) vane exit angle of less than 90°
(*c*) vane exit angle of more than 90°
(*d*) any vane exit angle
(*e*) none of the above.

9.56. Curve C holds goods for (refer. 9.3)
(*a*) vane exit angle of 90°
(*b*) vane exit angle of less than 90°
(*c*) vane exit angle of more than 90°
(*d*) any vane exit angle
(*e*) none of the above.

9.57. A turbine pump is basically a centrifugal pump equipped additionally with
(*a*) adjustable blades
(*b*) backward curved blades
(*c*) vaned diffusion casing
(*d*) inlet guide blades
(*e*) totally submerged operation facility.

9.58. The action of a centrifugal pump is as that of a
(*a*) reaction turbine
(*b*) impulse turbine
(*c*) reversed reaction turbine

(*d*) hydraulic ram
(*e*) none of the above.

9.59. In mixed flow centrifugal pump
(*a*) two fluids are mixed up at suction
(*b*) two fluids are pumped separately and then both mix up at delivery
(*c*) two impellers, radial and axial type are employed
(*d*) flow through the impeller is a combination of radial and axial flows
(*e*) such pumps do not exist.

9.60. If h and v stand for head and velocity and suffixes s, d and f for suction, delivery and friction, the manometric head of a centrifugal pump is equal to
(*a*) $h_s + h_d$
(*b*) $h_s + h_d + h_f$
(*c*) $h_s + h_d + h_f + \frac{v_s^2}{2g}$
(*d*) $h_s + h_d + h_f + \frac{v_d^2}{2g}$
(*e*) $h_s + h_d + h_f + \frac{v_s^2}{2g} + \frac{v_d^2}{2g}$.

9.61. To avoid cavitation in centrifugal pumps
(*a*) suction pressure should be low
(*b*) delivery pressure should be low
(*c*) suction pressure should be high
(*d*) delivery pressure should be high
(*e*) both suction and delivery pressures should be high.

9.62. The work requirement of a reciprocating pump with increase in acceleration head
(*a*) increases (*b*) decreases
(*c*) remains same
(*d*) may increase/decrease depending upon the head developed
(*e*) unpredictable.

9.63. A double acting reciprocating pump compared to single acting pump will have nearly
(*a*) double efficiency
(*b*) double head (*c*) double flow
(*d*) double weight
(*e*) four times power consumption.

9.64. For pumping viscous oil, which pump will be used
(*a*) centrifugal pump
(*b*) reciprocating pump
(*c*) turbine pump
(*d*) screw pump
(*e*) fuel pump as used in diesel engine.

9.65. When a centrifugal pump is started, there will be no flow of water until the pressure rise in the impeller is large enough to overcome the
(*a*) static head
(*b*) total head
(*c*) manometric head
(*d*) friction head
(*e*) all of the above.

9.66. Overall efficiency of a centrifugal pump is equal to
(*a*) volumetric η × manometric η × mechanical η
(*b*) volumetric η/manometric η × mechanical η
(*c*) manometric η/volumetric η × mechanical η
(*d*) mechanical η/manometric η × volumetric η
(*e*) mechanical η/volumetric η × manometric η.

9.67. Casting of a centrifugal pump is designed so as to minimise
(*a*) friction loss (*b*) cavitation
(*c*) static head
(*d*) loss of kinetic energy
(*e*) starting time.

9.68. The ratio of $\frac{\text{actual measured head}}{\text{(head imparted to fluid by impeller)}}$ for a centrifugal pump is known as
(*a*) mechanical η (*b*) volumetric η
(*c*) manometric η (*d*) overall η
(*e*) impeller η.

9.69. If P is the power developed by a turbine under a head of water H, then unit power developed by the turbine is
(*a*) $\frac{P}{H}$ (*b*) $\frac{P}{\sqrt{H}}$
(*c*) $\frac{P}{H^{3/2}}$ (*d*) $\frac{P}{H^2}$
(*e*) $\frac{P}{H^{5/2}}$.

9.70. The unit speed of the turbine runner is
(*a*) $\frac{N}{H}$ (*b*) $\frac{N}{\sqrt{H}}$

(c) $\frac{N}{H^{3/2}}$ (d) $\frac{N}{H^2}$
(e) $\frac{N}{H^{5/2}}$.

9.71. The unit discharge through a turbine is
(a) $\frac{Q}{H}$ (b) $\frac{Q}{\sqrt{H}}$
(c) $\frac{Q}{H^{3/2}}$ (d) $\frac{Q}{H^2}$
(e) $\frac{Q}{H^{5/2}}$.

9.72. The speed of a turbine and discharge through turbine are proportional to
(a) head H (b) $\sqrt{H}$
(c) H^2 (d) $H^{3/2}$
(e) $H^{5/2}$.

9.73. Specific speed of a turbine depends upon
(a) speed, power and discharge
(b) discharge and power
(c) speed and head
(d) speed, discharge and head
(e) speed, power and head.

9.74. The specific speed of a turbine is the speed of such a turbine, identical with a given turbine, which
(a) develops unit power under unit head
(b) develops unit power under unit discharge
(c) develops unit power under unit head
(d) develops unit speed under unit head
(e) delivers unit discharge under unit head.

9.75. Specific speed of turbine is indicated as
(a) $\frac{N\sqrt{Q}}{H^{3/4}}$ (b) $\frac{N\sqrt{P}}{H^{5/4}}$
(c) $\frac{N\sqrt{Q}}{H^{2/3}}$ (d) $\frac{N\sqrt{P}}{H^{3/2}}$
(e) $\frac{N\sqrt{P}}{H^{3/4}}$.

9.76. An impulse turbine
(a) operates submerged
(b) requires draft tube
(c) is most suited for low head applications
(d) operates by initial complete conversion to kinetic energy
(e) is not exposed to atmosphere.

9.77. A Pelton wheel is
(a) axial flow impulse turbine
(b) radial flow impulse turbine
(c) inward flow impulse turbine
(d) outward flow impulse turbine
(e) mixed flow impulse turbine.

9.78. Pelton wheels are used for minimum of following heads
(a) 20 m (b) 100 m
(c) 125 m (d) 180 m or above
(e) none of the above.

9.79. The ratio of width of bucket for a Pelton wheel to the diameter of jet is of the order of
(a) 2 (b) 3
(c) 4 (d) 5
(e) 6.

9.80. The ratio of depth of bucket for a Pelton wheel to the diameter of jet is of the order of
(a) 1 (b) 1.2
(c) 1.5 (d) 1.8
(e) 2.

9.81. If D is the diameter of Pelton wheel and d is the diameter of the jet, then number of buckets on the periphery of a Pelton wheel is equal to
(a) $\frac{D}{2d}$ (b) $\frac{D}{2d} + 10$
(c) $\frac{D}{2d} + 15$ (d) $\frac{D}{2d} + 20$
(e) $\frac{D}{2d} + 25$.

9.82. The maximum efficiency of a Pelton wheel working under a constant head and discharge with the increase in power
(a) increases (b) decreases
(c) remains unaffected
(d) initially increases and then decreases
(e) initially decreases and then increases.

9.83. Impulse turbine is used for
(a) low head (b) high head
(c) medium head (d) high flow
(e) high flow and high head.

9.84. For maximum efficiency, the speed of a pelton wheel as compared to the speed of the water jet is
(a) same (b) half
(c) thrice (d) four times

(e) one fourth.

9.85. If α is the angle of blade tip at outlet, then maximum hydraulic efficiency of an impulse turbine is

(a) $\frac{1+\cos\alpha}{2}$ (b) $\frac{1-\cos\alpha}{2}$

(c) $\frac{1-\sin\alpha}{2}$ (d) $\frac{1+\sin\alpha}{2}$

(e) $\frac{1-\tan\alpha}{2}$

9.86. In reaction turbine
(a) kinetic energy is appreciable as the fluid leaves the runner and enters draft tube
(b) the vanes are partly filled
(c) total energy of fluid is converted to kinetic energy in the runner
(d) it is exposed to atmosphere
(e) it is not exposed to atmosphere.

9.87. If α is the angle subtended by two adjacent buckets in a pelton wheel, then the no. of buckets is equal to
(a) 40/α (b) 180/α
(c) 270/α (d) 360/α
(e) any value between 180/α and 360/α.

9.88. In reaction turbine, draft tube is used
(a) to transport water downstream without eddies
(b) to convert the kinetic energy to flow energy by a gradual expansion of the flow cross-section
(c) for safety of turbine
(d) to increase flow rate
(e) none of the above.

9.89. Guide angle as per the aerofoil theory of Kaplan turbine blade design is defined as the angle between
(a) lift and resultant force
(b) drag and resultant force
(c) lift and tangential force
(d) lift and drag
(e) resultant force and tangential force.

9.90. Francis turbine is best suited for
(a) medium head application from 24 to 180 m
(b) low head installation upto 30 m
(c) high head installation above 180 m
(d) all types of heads
(e) none of the above.

9.91. Fig. 9.4 shows the part load performance curves of various turbines. Curve *A* is for

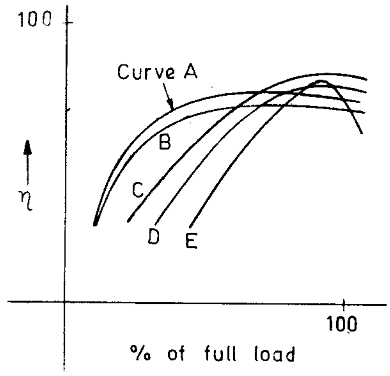

Fig. 9.4. Part load performance curve.

(a) Kaplan (b) Pelton wheel
(c) Francis low specific speed
(d) Francis high specific speed
(e) Fixed propeller.

9.92. Curve *B* is for (Refer Fig. 9.4)
(a) Kaplan (b) Pelton wheel
(c) Francis low specific speed
(d) Francis high specific speed
(e) Fixed propeller.

9.93. Curve *C* is for (Refer 9.4)
(a) Kaplan (b) Pelton wheel
(c) Francis low specific speed
(d) Francis high specific speed
(e) Fixed propeller.

9.94. Curve *D* is for (Refer Fig. 9.4)
(a) Kaplan (b) Pelton wheel
(c) Francis low specific speed
(d) Francis high specific speed
(e) Fixed propeller.

9.95. Curve *E* is for (Refer Fig. 9.4)
(a) Kaplan (b) Pelton wheel
(c) Francis low specific speed
(d) Francis high specific speed
(e) Fixed propeller.

9.96. Propeller turbine is best suited for
(a) medium head application from 20 to 180 m
(b) low head installation upto 30 m
(c) high head installation above 180 m
(d) all types of heads
(e) none of the above.

9.97. Speed ratio of a Pelton turbine is defined as

(*a*) $\frac{\text{actual speed}}{\text{theoretical speed}}$
(*b*) $\frac{\pi \times \text{runner dia.} \times \text{R.P.M.}}{60 \times \sqrt{2 \times g \times \text{head on turbine}}}$
(*c*) $\frac{60 \times \sqrt{2 \times g \times \text{head on turbine}}}{\pi \times \text{runner dia.} \times \text{R.P.M}}$
(*d*) $\frac{\text{speed of runner}}{\text{velocity of flow in penstock}}$
(*e*) $\frac{\text{actual speed}}{\text{synchronous speed}}$

9.98. Specific speed for impulse wheels ranges from
(*a*) 0 to 4.5 (*b*) 10 to 100
(*c*) 80 to 200 (*d*) 250 to 300
(*e*) none of the above.

9.99. The ratio of power produced by the turbine to the energy actually supplied by the turbine is called
(*a*) mechanical efficiency
(*b*) hydraulic efficiency
(*c*) overall efficiency
(*d*) turbine efficiency
(*e*) relative efficiency.

9.100. The ratio of actual work available at the turbine to energy imparted to the wheel is called
(*a*) mechanical efficiency
(*b*) hydraulic efficiency
(*c*) overall efficiency
(*d*) turbine efficiency
(*e*) relative efficiency.

9.101. The ratio of the work done on the wheel to the energy (or head of water) actually supplied to the turbine is called
(*a*) mechanical efficiency
(*b*) hydraulic efficiency
(*c*) overall efficiency
(*d*) turbine efficiency
(*e*) relative efficiency.

9.102. The flow rate in gear pump
(*a*) increases with increase in pressure
(*b*) decreases with increase in pressure
(*c*) more or less remains constant with increase in pressure
(*d*) unpredictable
(*e*) none of the above.

9.103. Impulse turbine is generally fitted
(*a*) at the level of tail race
(*b*) little above the tail race
(*c*) slightly below the tail race
(*d*) about 2.5 m above the tail race to avoid cavitation
(*e*) about 2.5 m below the tail race to avoid cavitation.

9.104. Francis, Kaplan and propeller turbines fall under the category of
(*a*) Impulse turbines
(*b*) Reaction turbines
(*c*) Axial flow turbines
(*d*) Mixed flow turbines
(*e*) Reaction-cum-impulse turbines.

9.105. Reaction turbines are used for
(*a*) low head (*b*) high head
(*c*) high head and low discharge
(*d*) high head and high discharge
(*e*) low head and high discharge.

9.106. The discharge through a reaction turbine with increase in unit speed
(*a*) increases (*b*) decreases
(*c*) remains unaffected
(*d*) first increases and then decreases
(*e*) first decreases and then increases.

9.107. The angle of taper on draft tube is
(*a*) greater than 15°
(*b*) greater than 8°
(*c*) greater than 5°
(*d*) less than 8°
(*e*) less than 3°.

9.108. Specific speed for reaction turbines ranges from
(*a*) 0 to 4.5 (*b*) 10 to 100
(*c*) 80 to 200 (*d*) 250 to 300
(*e*) none of the above.

9.109. In axial flow fans and turbines, fluid enters and leaves as follows
(*a*) radially, axially
(*b*) axially, radially
(*c*) axially, axially
(*d*) radially, radially
(*e*) combination of axial and radial.

9.110. Which place in hydraulic turbine is most susceptible for cavitation
(*a*) inlet of draft tube
(*b*) blade inlet (*c*) guide blade
(*d*) penstock (*e*) draft tube exit.

9.111. The suction lift of low-speed reciprocating pumps

(*a*) remains fairly constant upto water temperature of 40°C and thereafter decreases slowly first and then rapidly
(*b*) decreases linearly with increase in temperature of water to be pumped
(*c*) increases linearly with increase in temperature of water to be pumped
(*d*) has no correlation with water temperature
(*e*) remains constant with increase in water temperature.

9.112. It is possible to pump water available at around 100°C under atmosphere conditions using centrifugal pump placed near the tank
(*a*) No (*b*) Yes
(*c*) Yes, only if pump is properly selected
(*d*) Yes, only if material of pump is selected properly
(*e*) none of the above.

9.113. The ratio of submergence to lift in air lift pump with increase of lift
(*a*) increases (*b*) decreases
(*c*) remains same (*d*) unpredictable
(*e*) none of the above.

9.114. The reaction type hydraulic turbines usually have their shafts arranged
(*a*) vertically (*b*) horizontally
(*c*) inclined
(*d*) may be either vertical or horizontal depending upon capacity
(*e*) none of the above.

9.115. Specific speed for axial flow turbines varies from
(*a*) 0 to 4.5 (*b*) 10 to 100
(*c*) 80 to 200 (*d*) 250 to 350
(*e*) none of the above.

9.116. Specific speed of hydraulic turbine is dependent upon
(*a*) speed, power developed and flow
(*b*) speed, power developed and effective head
(*c*) speed, head and flow
(*d*) speed, mean diameter and head
(*e*) speed, mean diameter and flow.

9.117. Kaplan turbine
(*a*) is used where high head is available
(*b*) has poor part-load efficiency
(*c*) has inlet adjustable guide vanes
(*d*) has adjustable runner blades
(*e*) is always located below the tail race level.

9.118. In Kaplan turbine runner, the number of blades is generally of the order
(*a*) 2–4 (*b*) 4–8
(*c*) 8–16 (*d*) 16–24
(*e*) 24–32.

9.119. In Francis turbine runner, the number of blades is generally of the order of
(*a*) 2–4 (*b*) 4–8
(*c*) 8–16 (*d*) 16–24
(*e*) 24–32.

9.120. A draft tube is used with
(*a*) impulse turbine
(*b*) pelton wheel turbine
(*c*) reaction turbines
(*d*) very high specific speed turbines
(*e*) axial turbine pumps.

9.121. For a given head the discharge through a pelton turbine with increase in speed
(*a*) increases (*b*) decreases
(*c*) remains unaffected
(*d*) depends upon specific speed only
(*e*) may increase/decrease depending on the length of draft tube.

9.122. According to the laws of proportionality for homologous turbines, power is proportional to
(*a*) DH (D = diameter H = head)
(*b*) D^2H
(*c*) $D^2H^{3/2}$ (*d*) $\sqrt{DH^{3/2}}$
(*e*) $D^2\sqrt{H}$.

9.123. According to the laws of proportionality for homologous turbines, speed is proportional to
(*a*) $\sqrt{H}/D$ (*b*) $\sqrt{H/D}$
(*c*) $\sqrt{H}/D^2$ (*d*) $H^{3/2}/D$
(*e*) $\sqrt{HD}$.

9.124. According to the laws of proportionality for homologous turbines, discharge is proportional to
(*a*) $D\sqrt{H}$ (*b*) $D^2\sqrt{H}$
(*c*) $D^2H^{3/2}$ (*d*) D^2H
(*e*) $DH^{3/2}$.

9.125. Francis turbine is
(*a*) radial flow turbine

(*b*) axial flow turbine
(*c*) mixed flow turbine
(*d*) inward flow radial type turbine
(*e*) outward flow radial type turbine.

9.126. If pump NPSH requirements are not satisfied,
(*a*) it will not develop head
(*b*) it will be cavitated
(*c*) efficiency will be low
(*d*) it will consume excessive power
(*e*) no flow will take place.

9.127. Which of the following is not a rotary pump
(*a*) gear (*b*) vane
(*c*) screw (*d*) axial
(*e*) cam and piston.

9.128. Pick up the correct statement
Rotary pumps are
(*a*) just like centrifugal pumps
(*b*) suitable for both high flow and low head
(*c*) positive displacement type
(*d*) suitable only for clean and clear liquids
(*e*) have pulsating discharge.

9.129. Impellers for high heads usually have
(*a*) high specific speed
(*b*) low specific speed
(*c*) medium specific speed
(*d*) any specific speed depending on flow and speed
(*e*) variable specific speed.

9.130. As specific speed of a centrifugal pump increases, it's blade height
(*a*) increases (*b*) decreases
(*c*) remains unaffected
(*d*) increase or decrease depends on other factors
(*e*) none of the above is true.

9.131. Which of the following pumps is used for pumping viscous fluids
(*a*) centrifugal pump
(*b*) screw pump
(*c*) reciprocating pump
(*d*) jet pump (*e*) air lift pump.

9.132. For flood control and irrigation applications, the pump generally used is
(*a*) centrifugal type
(*b*) reciprocating type
(*c*) axial flow type
(*d*) radial flow type
(*e*) screw type.

9.133. For small discharge and high heads which pump is preferred
(*a*) centrifugal type
(*b*) reciprocating type
(*c*) axial flow type
(*d*) radial flow type
(*e*) screw type.

9.134. Higher specific speed (161 to 500) of centrifugal pump indicates, that pump is
(*a*) radial type (*b*) mixed flow type
(*c*) axial flow
(*d*) any one of the above
(*e*) none of the above.

9.135. Fig. 9.5 shows the variation of efficiency, head and power input of centrifugal pump at various flows

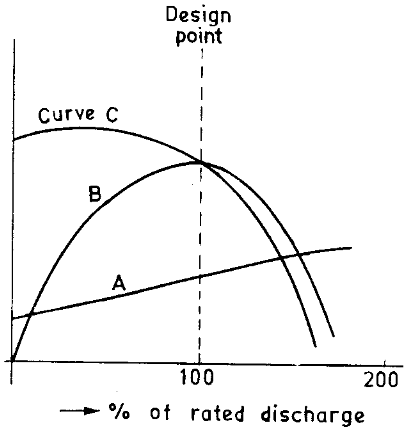

Fig. 9.5.

Curve A is for
(*a*) head (*b*) efficiency
(*c*) power input (*d*) all of the above
(*e*) none of the above.

9.136. Curve *B* is for (Refer Fig. 9.5)
(*a*) head (*b*) efficiency
(*c*) power input (*d*) all of the above
(*e*) none of the above.

9.137. Curve *C* is for (Refer Fig. 9.5)
(*a*) head (*b*) efficiency
(*c*) power input (*d*) all of the above
(*e*) none of the above.

9.138. Fig. 9.6 shows the variation of efficiency, head and power input of axial flow pump of various flows. Curve *A* is for

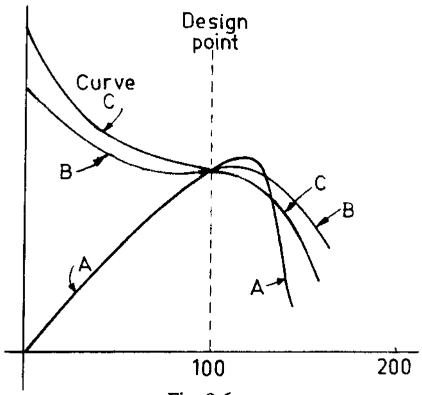

Fig. 9.6.

(*a*) head (*b*) power input
(*c*) efficiency (*d*) all of the above
(*e*) none of the above.

9.139. Curve *B* is for (Refer Fig. 9.6)
(*a*) head (*b*) power input
(*c*) efficiency (*d*) all of the above
(*e*) none of the above.

9.140. Curve *C* is for (Refer Fig. 9.6)
(*a*) head (*b*) power point
(*c*) efficiency (*d*) all of the above
(*e*) none of the above.

9.141. Cavitation in hydraulic turbine results in
(*a*) noise and vibration
(*b*) reduction of discharge
(*c*) drop in output and efficiency
(*d*) rough surfaces
(*e*) all of the above.

9.142. The cavitation in reaction type hydraulic turbines is avoided by
(*a*) using highly polished blade
(*b*) using stainless steel runner
(*c*) running turbine at designed speed
(*d*) installing the turbine below the tail race level
(*e*) all of the above.

9.143. Runaway speed of a hydraulic turbine corresponds to the condition of
(*a*) runner revolving freely without load and with the gates wide open
(*b*) critical speed (*c*) breakage of runner
(*d*) speed obtained when load is suddenly disconnected
(*e*) speed attained with failure of governor.

9.144. The runaway speed of the Francis turbine depending on the specific speed, varies from
(*a*) 100—200% (*b*) 170—195%
(*c*) 200—245% (*d*) 400—500%
(*e*) upto 1000%.

9.145. Higher specific speed (300 to 1000) of turbine indicates that turbine is
(*a*) Pelton wheel
(*b*) Kaplan
(*c*) Francis
(*d*) any one of the above
(*e*) none of the above.

9.146. Choose the wrong statement
(*a*) impulse type hydraulic turbine is suited for high heads
(*b*) propeller type hydraulic turbine is suited for low heads
(*c*) Francis turbine is medium speed turbine, suitable for medium heads
(*d*) impulse type turbine is high specific speed turbine
(*e*) for higher speeds more than one runner may be employed on one shaft on horizontal shaft arrangement.

9.147. Choose the wrong statement for hydraulic turbines
(*a*) speed $(N) \propto \frac{1}{D}$ (D = diameter)
(*b*) Power $(P) \propto D^2$
(*c*) $N \propto \sqrt{H}$ (H = head)
(*d*) $P \propto H^{3/2}$
(*e*) $P \propto N^3$.

9.148. A centrifugal pump draws in too much power compared to design value. It could be due to
(*a*) air leakage
(*b*) presence of air in water
(*c*) hot liquid
(*d*) heavy liquid
(*e*) reverse rotation of pump.

9.149. Fig. 9.7, shows three curves *A*, *B*, *C* for three hydraulic turbines between load and efficiency. These turbines respectively are
(*a*) adjustable blade propeller, (ABP), fixed blade propeller, (FBP), and Francis turbine (FT)
(*b*) FBP, FT, ABP
(*c*) FBP, ABP, FT

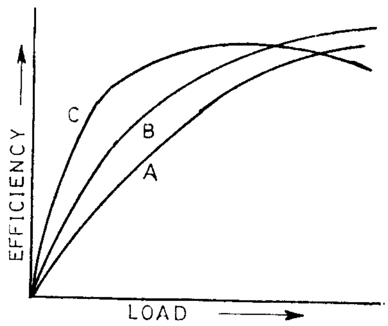

Fig. 9.7.

(*d*) FT, ABP, FBP
(*e*) FT, FBP, ABP.

9.150. No flow interaction would occur with air vessel in a double acting reciprocating pump in the following crank angle position
(*a*) 0 and 90°
(*b*) 90° and 180°
(*c*) 45° and 125°
(*d*) 39° 34′ and 140° 26′
(*e*) 16° 34′ and 164° 26′.

9.151. Air vessels used in reciprocating pumps are initially filled with
(*a*) compressed air
(*b*) water
(*c*) water at high pressure
(*d*) vacuum
(*e*) none of the above

9.152. Air vessels in reciprocating pump are used to
(*a*) smoothen flow
(*b*) reduce acceleration to minimum
(*c*) increase pump efficiency
(*d*) save pump from cavitation
(*e*) increase pump head.

9.153. Saving of work done and power by fitting an air vessel to single acting reciprocating pump is of the order of
(*a*) 39.2% (*b*) 49.2%
(*c*) 68.8% (*d*) 84.8%
(*e*) 91.6%.

9.154. Saving of work done and power by fitting an air vessel to double acting reciprocating pump is of the order of
(*a*) 39.2% (*b*) 49.2%
(*c*) 68.8% (*d*) 84.8%
(*e*) 91.6%.

9.155. According to fan laws, for fans having constant wheel diameter, the air or gas capacity varies
(*a*) directly as fan speed
(*b*) square of fan speed
(*c*) cube of fan speed
(*d*) square root of fan speed
(*e*) none of the above.

9.156. According to fan laws, for fans having constant wheel diameter, the pressure varies
(*a*) directly as fan speed
(*b*) square of fan speed
(*c*) cube of fan speed
(*d*) square root of fan speed
(*e*) none of the above.

9.157. According to fan laws, for the fans having constant wheel diameters, the power demand varies
(*a*) directly as fan speed
(*b*) square of fan speed
(*c*) cube of fan speed
(*d*) square root of fan speed
(*e*) none of the above.

9.158. According to fan laws, at constant speed and capacity, the pressure and power vary
(*a*) directly as the air or gas density
(*b*) inversely as square root of density
(*c*) inversely as density
(*d*) as square of density
(*e*) as square root of density.

9.159. According to fan laws, at constant pressure, the speed capacity and power vary
(*a*) directly as the air or gas density
(*b*) inversely as square root of density
(*c*) inversely as density
(*d*) as square of density
(*e*) as square root of density.

9.160. According to fan laws, at constant weight of air or gas, the speed, capacity and pressure vary
(*a*) directly as the air or gas density
(*b*) inversely as square root of density
(*c*) inversely as density
(*d*) as square of density
(*e*) as square root of density.

9.161. Capacity of hydraulic accumulator is generally specified as
(*a*) quantity of liquid accumulated

(*b*) maximum flow rate through accumulator
(*c*) height raising capability of accumulator
(*d*) maximum pressure developed
(*e*) maximum energy stored.

9.162. Pressure intensifier increases the pressure in proportion to
(*a*) ratio of diameters
(*b*) square of ratio of diameters
(*c*) inverse ratio of diameters
(*d*) square of inverse ratio of diameters
(*e*) fourth power of ratio of diameters.

9.163. A hydraulic accumulator normally consists of
(*a*) two cylinders, two rams and a storage device
(*b*) a cylinder and a ram
(*c*) two co-axial rams and two cylinders
(*d*) a cylinder, a piston, storage tank and control valve
(*e*) special type of pump with storage device and a pressure regulator.

9.164. A hydraulic intensifier normally consists of
(*a*) two cylinders, two rams and a storage device
(*b*) a cylinder and a ram
(*c*) two co-axial rams and two cylinders
(*d*) a cylinder, a piston, storage tank and control valve
(*e*) special type of pump with storage device and a pressure regulator.

9.165. Hydraulic accumulator is used for
(*a*) accumulating oil
(*b*) supplying large quantities of oil for very short duration
(*c*) generally high pressures to operate hydraulic machines
(*d*) supplying energy when main supply fails
(*e*) accumulating hydraulic energy.

9.166. Maximum impulse will be developed in hydraulic ram when
(*a*) waste valve closes suddenly
(*b*) supply pipe is long
(*c*) supply pipe is short
(*d*) ram chamber is large
(*e*) supply pipe has critical diameter.

9.167. The maximum continuous power available from a hydroelectric plant under the most adverse hydraulic conditions, is known as
(*a*) Base power (*b*) Firm power
(*c*) Primary power (*d*) Secondary power
(*e*) Installed capacity.

9.168. A plot between power generated in MW and time is known as
(*a*) Load curve
(*b*) Load duration curve
(*c*) Load factor (*d*) Demand curve
(*e*) None of the above.

9.169. Load factor is equal to
(*a*) $\dfrac{\text{Peak load in a certain period}}{\text{Average load during that period}}$
(*b*) $\dfrac{\text{Average load over a certain period}}{\text{Maximum load occurring during the same period}}$
(*c*) $\dfrac{\text{Average load over a cetain period}}{\text{Plant installed capacity}}$
(*d*) $\dfrac{\text{Average plant capacity utilization}}{\text{Actual load or plant during that period}}$
(*e*) None of the above.

9.170. $\dfrac{\text{Average generation in KWH per year}}{\text{Installed capacity in kW} \times \text{hrs per year}}$ is known as
(*a*) Plant factor (*b*) Capacity factor
(*c*) Use factor (*d*) Any of the above
(*e*) None of the above.

9.171. The ratio of maximum load to rated plant capacity is known as
(*a*) Load factor (*b*) Utilization factor
(*c*) Maximum load factor
(*d*) Capacity factor
(*e*) Plant factor.

9.172. Portion of the installed reserve kept in operable condition but not placed in service to supply the peak load is known as
(*a*) Operating reserve
(*b*) Spinning reserve
(*c*) Cold reserve (*d*) Hot reserve
(*e*) Non-spinning reserve.

9.173. Capacity of a hydroelectric plant in service in excess of the peak load is known as
(*a*) Operating reserve
(*b*) Spinning reserve
(*c*) Cold reserve
(*d*) Hot reserve
(*e*) Peak reserve.

10

Engineering Mechanics

10.1. The unit of force in S.I. units is
(*a*) kilogram (*b*) newton
(*c*) watt (*d*) dyne
(*e*) joule.

10.2. The unit of work or energy in S.I. units is
(*a*) newton (*b*) pascal
(*c*) kilogram metre
(*d*) watt (*e*) joule.

10.3. The unit of power in S.I. units is
(*a*) newton metre (*b*) watt
(*c*) joule (*d*) kilogram metre/sec.
(*e*) pascal per sec.

10.4. Forces are called concurrent when their lines of action meet in
(*a*) one point (*b*) two points
(*c*) plane (*d*) perpendicular planes
(*e*) different planes.

10.5. Forces are called coplanar when all of them acting on body lie in
(*a*) one point (*b*) one plane
(*c*) different planes
(*d*) perpendicular planes
(*e*) different points.

10.6. A force acting on a body may
(*a*) introduce internal stresses
(*b*) balance the other forces acting on it
(*c*) retard its motion
(*d*) change its motion
(*e*) all of the above.

10.7. Which is the correct statement about law of polygon of forces ?
(*a*) if any number of forces acting at a point can be represented by the sides of a polygon taken in order, then the forces are in equilibrium
(*b*) if any number of forces acting at a point can be represented in direction and magnitude by the sides of a polygon, then the forces are in equilibrium
(*c*) if a polygon representing forces acting at a point is closed then forces are in equilibrium
(*d*) if any number of forces acting at a point can be represented in direction and magnitude by the sides of a polygon taken in order, then the forces are in equilibrium
(*e*) none of the above.

10.8. Effect of a force on a body depends upon
(*a*) magnitude
(*b*) direction
(*c*) position or line of action
(*d*) all of the above
(*e*) none of the above.

10.9. If a number of forces act simultaneously on a particle, it is possible
(*a*) not a replace them by a single force
(*b*) to replace them by a single force
(*c*) to replace them by a single force through C.G.
(*d*) to replace them by a couple
(*e*) to replace them by a couple and a force.

10.10. If the resultant of two forces P and Q acting at an angle θ makes an angle α with P, then
(*a*) $\tan \alpha = \dfrac{P \sin \theta}{Q - P \cos}$

(*b*) $\tan\alpha = \dfrac{Q\sin\theta}{P + Q\cos\theta}$

(*c*) $\tan\alpha = \dfrac{P\sin\theta}{P + Q\tan\theta}$

(*d*) $\tan\alpha = \dfrac{Q\sin\theta}{P - Q\sin\theta}$

(*e*) $\tan\alpha = \dfrac{P\sin\theta}{P + Q\sin\theta}$.

10.11. A force is completely defined when we specify
(*a*) magnitude
(*b*) direction
(*c*) point of application
(*d*) all of the above
(*e*) none of the above.

10.12. If two equal forces of magnitude P act at an angle $\theta°$, their resultant will be
(*a*) $P/2\cos\theta/2$ (*b*) $2P\sin\theta/2$
(*c*) $2P\tan\theta/2$ (*d*) $2P\cos\theta/2$
(*e*) $P\sin\theta/2$.

10.13. The algebraic sum of the resolved parts of a number of forces in a given direction is equal to the resolved part of their resultant in the same direction. This is as per the principle of
(*a*) forces
(*b*) independence of forces
(*c*) dependence of forces
(*d*) balance of force
(*e*) resolution of forces.

10.14. The resolved part of the resultant of two forces inclined at an angle θ in a given direction is equal to
(*a*) the algebraic sum of the resolved parts of the forces in the given direction
(*b*) the sum of the resolved parts of the forces in the given direction
(*c*) the difference of the forces multiplied by the cosine of θ
(*d*) the sum of the forces multiplied by the sine of θ
(*e*) the sum of the forces multiplied by the tangent of θ.

10.15. Which of the following do not have identical dimensions ?
(*a*) Momentum and impulse
(*b*) Torque and energy
(*c*) Torque and work
(*d*) Kinetic energy and potential energy
(*e*) Moment of a force and angular momentum.

10.16. Which of the following is not the unit of distance ?
(*a*) angstrom (*b*) light year
(*c*) micron (*d*) millimetre
(*e*) milestone.

10.17. Which of the following is not the unit of power ?
(*a*) kW (kilowatt) (*b*) hp (horse power)
(*c*) kcal/sec (*d*) kg m/sec
(*e*) kcal/kg sec.

10.18. Which of the following is not the unit of work, energy and heat ?
(*a*) kcal (*b*) kg m
(*c*) kWhr (*d*) hp
(*e*) hp hr.

10.19. Which of the following is not the unit of pressure ?
(*a*) kg/cm^2 (*b*) ata
(*c*) atmosphere (*d*) mm of wcl
(*e*) newton.

10.20. The weight of a body is due to
(*a*) centripetal force of earth
(*b*) gravitational pull exerted by the earth
(*c*) forces experienced by body in atmosphere
(*d*) force of attraction experienced by particles
(*e*) gravitational force of attraction towards the centre of the earth.

10.21. The forces, which meet at one point, but their lines of action do not lie in a plane, are called
(*a*) coplanar non-concurrent forces
(*b*) non-coplanar concurrent forces
(*c*) non-coplanar non-concurrent forces
(*d*) intersecting forces
(*e*) none of the above.

10.22. When trying to turn a key into a lock, following is applied
(*a*) coplanar force
(*b*) non-coplanar forces
(*c*) lever
(*d*) moment
(*e*) couple.

10.23. Which of the following is not a scalar quantity
(*a*) time (*b*) mass

(*c*) volume (*d*) density
(*e*) acceleration.

10.24. According to principle of transmissibility of forces, the effect of a force upon a body is
(*a*) maximum when it acts at the centre of gravity of a body
(*b*) different at different points in its line of action
(*c*) the same at every point in its line of action
(*d*) minimum when it acts at the C.G. of the body
(*e*) none of the above.

10.25. Which of the following is a vector quantity
(*a*) energy (*b*) mass
(*c*) momentum (*d*) angle
(*e*) speed.

10.26. The magnitude of two forces, which when acting at right angle produce resultant force of $\sqrt{10}$kg and when acting at 60° produce resultant of $\sqrt{13}$ kg. These forces are
(*a*) 2 and $\sqrt{6}$
(*b*) 3 and 1 kg
(*c*) $\sqrt{5}$ and $\sqrt{5}$
(*d*) 2 and 5
(*e*) none of the above.

10.27. A number of forces acting at a point will be in equilibrium if
(*a*) their total sum is zero
(*b*) two resolved parts in two directions at right angles are equal
(*c*) sum of resolved parts in any two perpendicular directions are both zero
(*d*) all of them are inclined equally
(*e*) none of the above.

10.28. Two non-collinear parallel equal forces acting in opposite direction
(*a*) balance each other
(*b*) constitute a moment
(*c*) constitute a couple
(*d*) constitute a moment of couple
(*e*) constitute a resultant couple.

10.29. According to principle of moments
(*a*) if a system of coplanar forces is in equilibrium, then their algebraic sum is zero
(*b*) if a system of coplanar forces is in equilibrium, then the algebraic sum of their moments about any point in their plane is zero
(*c*) the algebraic sum of the moments of any two forces about any point is equal to moment of their resultant about the same point
(*d*) positive and negative couples can be balanced
(*e*) none of the above.

10.30. Which of the following is not a vector quantity
(*a*) weight (*b*) velocity
(*c*) acceleration (*d*) force
(*e*) moment.

10.31. According to law of triangle of forces
(*a*) three forces acting at a point will be in equilibrium
(*b*) three forces acting at a point can be represented by a triangle, each side being proportional to force
(*c*) if three forces acting upon a patticle are represented in magnitude and direction by the sides of a triangle, taken in order, they will be in equilibrium
(*d*) if three forces acting at a point are in equilibrium, each force is proportional to the sine of the angle between the other two
(*e*) none of the above.

10.32. A known force R is to be replaced by two forces P and Q parallel to it and at distance a and b from R (Refer Fig. 10.1). Force P will be equal to

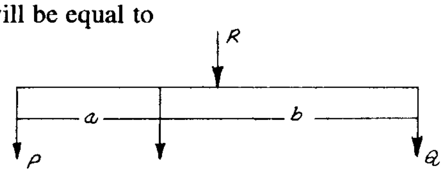

Fig. 10.1.

(*a*) $R/2$ (*b*) R
(*c*) $\frac{Rb}{a+b}$ (*d*) $\frac{Ra}{a+b}$
(*e*) none of the above.

10.33. If a rigid body is in equilibrium under the action of three forces, then
(*a*) these forces are equal
(*b*) the lines of action of these forces meet in a point

(c) the lines of action of these forces are parallel
(d) (b) and (c) above
(e) none of the above.

10.34. If two forces each equal to P in magnitude act at right angles, their effect may be neutralised by a third force acting along their bisector in opposite direction whose magnitude is equal to
(a) $2P$ (b) $P/2$
(c) $\sqrt{2}P$ (d) $P/\sqrt{2}$
(e) $3P$.

10.35. The resultant of two forces P and Q inclined at angle θ will be inclined at following angle w.r.t. P
(a) $\frac{\theta}{2}$ (b) $\tan^{-1}\frac{Q \sin\theta}{P + Q\cos\theta}$
(c) $\tan^{-1}\frac{P \sin\theta}{Q + P\cos\theta}$
(d) $\tan^{-1}\frac{Q \cos\theta}{Q + P\sin\theta}$
(e) $\tan^{-1}\frac{P \cos\theta}{Q + P\sin\theta}$.

10.36. D' Alembert's principle is used for
(a) reducing the problem of kinetics to equivalent statics problem
(b) determining stresses in the truss
(c) stability of floating bodies
(d) designing safe structures
(e) solving kinematic problems.

10.37. A heavy ladder resting on floor and against a vertical wall may not be in equilibrium, if
(a) the floor is smooth, the wall is rough
(b) the floor is rough, the wall is smooth
(c) the floor and wall both are smooth surfaces
(d) the floor and wall both are rough surfaces
(e) will be in equilibrium under all conditions.

10.38. According to Lami's theorem
(a) three forces acting at a point will be in equilibrium
(b) three forces acting at a point can be represented by a triangle, each side being proportional to force
(c) if three forces acting upon a particle are represented in magnitude and direction by the sides of a triangle, taken in order, they will be in equilibrium
(d) if three forces acting at a point are in equilibrium, each force is proportional to the sine of the angle between the other two
(e) none of the above.

10.39. Two coplanar couples having equal and opposite moments
(a) balance each other
(b) produce a couple and an unbalanced force
(c) are equivalent
(d) produce a moment of couple
(e) can not balance each other.

10.40. A framed structure is perfect if it contains members equal to
(a) $2n - 3$ (b) $n - 1$
(c) $2n - 1$ (d) $n - 2$
(e) $3n - 2$.
where n = number of joints in a frame

10.41. At what height from the base of a pillar must the end of a rope of given length (l) be fixed so that a man standing on the ground and pulling it at the other end with given force may have the greatest tendency to make the pillar overturn
(a) $l/2$ (b) $2l/3$
(c) $l/\sqrt{2}$ (d) $3l/4$
(e) $\sqrt{l/2}$.

10.42. The product of either force of couple with the arm of the couple is called
(a) resultant couple
(b) moment of the forces
(c) resulting couple
(d) moment of the couple
(e) none of the above.

10.43. In determining stresses in frames by methods of sections, the frame is divided into two parts by an imaginary section drawn in such a way as not to cut more than
(a) two members with unknown forces of the frame
(b) three members with unknown forces of the frame
(c) four members with unknown forces of the frame
(d) three members with known forces of the frame
(e) four members with two known forces.

10.44. The centre of gravity of a uniform lamina lies at
(*a*) the centre of heavy portion
(*b*) the bottom surface
(*c*) the mid point of its axis
(*d*) all of the above
(*e*) none of the above.

10.45. Centre of gravity of a solid cone lies on the axis at the height
(*a*) one-fourth of the total height above base
(*b*) one-third of the total height above base
(*c*) one-half of the total height above base
(*d*) three-eighth of the total height above the base
(*e*) none of the above.

10.46. Centre of percussion is
(*a*) the point of C.G.
(*b*) the point of metacentre
(*c*) the point of application of the resultant of all the forces tending to cause a body to rotate about a certain axis
(*d*) point of suspension
(*e*) the point in a body about which it can rotate horizontally and oscillate under the influence of gravity.

10.47. Centre of gravity of a thin hollow cone lies on the axis at a height of
(*a*) one-fourth of the total height above base
(*b*) one-third of the total height above base
(*c*) one-half of the total height above base
(*d*) three-eighth of the total height above the base
(*d*) none of the above.

10.48. The units of moment of inertia of an area are
(*a*) kg m^2 (*b*) m^4
(*c*) kg/m^2 (*d*) m^3
(*e*) kg/m^4.

10.49. The centre of percussion of the homogeneous rod of length L suspended at the top will be
(*a*) $L/2$ (*b*) $L/3$
(*c*) $3L/4$ (*d*) $2L/3$
(*e*) $3L/8$.

10.50. The centre of gravity of a triangle lies at the point of
(*a*) concurrence of the medians
(*b*) intersection of its altitudes
(*c*) intersection of bisector of angles
(*d*) intersection of diagonals
(*e*) all of the above.

10.51. The units of moment of inertia of mass are
(*a*) kg m^2 (*b*) m^4
(*c*) kg/m^2 (*d*) kg/m
(*e*) m^2/kg.

10.52. The possible loading in various members of framed structures are
(*a*) compression or tension
(*b*) buckling or shear
(*c*) shear or tension
(*d*) all of the above
(*e*) bending.

10.53. A heavy string attached at two ends at same horizontal level and when central dip is very small approaches the following curve
(*a*) catenary (*b*) parabola
(*c*) hyperbola (*d*) elliptical
(*e*) circular arc.

10.54. A trolley wire weighs 1.2 kg per metre length. The ends of the wire are attached to two poles 20 metres apart. If the horizontal tension is 1500 kg find the dip in the middle of the span
(*a*) 2.5 cm (*b*) 3.0 cm
(*c*) 4.0 cm (*d*) 5.0 cm
(*e*) 2.0 cm.

10.55. From a circular plate of diameter 6 cm is cut out a circle whose diameter is a radius of the plate. Find the c.g. of the remainder from the centre of circular plate
(*a*) 0.5 cm (*b*) 1.0 cm
(*c*) 1.5 cm (*d*) 2.5 cm
(*e*) 0.25 cm.

10.56. A rope is wrapped twice around a rough pole with a coefficient to friction μ. It is subjected to a force F_1 at one end. A gradually increasing force F_2 is applied at the other end till the rope just starts slipping. At this instant the ratio of F_2 to F_1 is
(*a*) 1 (*b*) $e^{4\pi\mu}$
(*c*) $e^{2\mu}$ (*d*) $e^{\mu 360}$
(*e*) none of the above.

10.57. M.I. of a thin circular ring of radius r and mass M about an axis perpendicular to plane of ring is

(a) Mr^2 (b) $\frac{\pi r^4}{2}$
(c) $\frac{2}{5}Mr^2$ (d) $\frac{2}{3}Mr^2$
(e) $\frac{Mr^2}{2}$.

10.58. Pick up the incorrect statement from the following :
(a) The C.G. of a circle is at its centre
(b) The C.G. of a triangle is at the intersection of its medians
(c) The C.G. of a rectangle is at the intersection of its diagonals
(d) The C.G. of a semicircle is at a distance of r/2 from the centre
(e) The C.G. of an ellipse is at its centre.

10.59. The centre of percussion of a solid cylinder of radius r resting on a horizontal plane will be
(a) $r/2$ (b) $2r/3$
(c) $r/4$ (d) $3r/2$
(e) $3r/4$.

10.60. M.I. of a circular area about an axis perpendicular to the area is
(a) Mr^2 (b) $\frac{\pi r^4}{2}$
(c) $\frac{2}{5}Mr^2$ (d) $\frac{2}{3}Mr^2$
(e) $\frac{Mr^2}{2}$.

10.61. The M.I. of a thin ring, external diameter D, internal diameter d, about an axis perpendicular to the plane of the ring is
(a) $\frac{\pi}{64}(D^4+d^4)$ (b) $\frac{\pi}{64}(D^4-d^4)$
(c) $\frac{\pi}{32}(D^4+d^4)$ (d) $\frac{\pi}{32}(d^4+D^4)$
(e) $\frac{\pi}{32}(D^4-d^4)$.

10.62. In the equation of virtual work, following force is neglected
(a) reaction of any smooth surface with which the body is in contact
(b) reaction of a rough surface of a body which rolls on it without slipping
(c) reaction at a point or an axis, fixed in space, around which a body is constrained to turn
(d) all of the above
(e) none of the above.

10.63. If a suspended body is struck at the centre of percussion, then the pressure on the axis passing through the point of suspension will be
(a) maximum (b) minimum
(c) zero (d) infinity
(e) same as the force applied.

10.64. M.I. of a solid sphere is
(a) Mr^2 (b) $\frac{\pi r^4}{2}$
(c) $\frac{2}{5}Mr^2$ (d) $\frac{2}{3}Mr^2$
(e) $\frac{Mr^2}{2}$.

10.65. The resultant of the following three couples
20 kg force, 0.5 m arm, + ve sense
30 kg force, 1 m arm, – ve sense
40 kg force, 0.25 m arm, + ve sense
having arm of 0.5 m will be
(a) 20 kg, – ve sense
(b) 20 kg, + ve sense
(c) 10 kg, + ve sense
(d) 10 kg, – ve sense
(e) 45 kg, + ve sense.

10.66. M.I. of an elliptical area having major and minor diameters as x and y, about the major axis is
(a) πxy^3 (b) $\frac{\pi yx^3}{4}$
(c) $\frac{\pi x^2y^3}{4}$ (d) $\frac{\pi}{3}x^2y^2$
(e) $\frac{\pi}{3}xy^3$.

10.67. M.I. of thin spherical shell is
(a) Mr^2 (b) $\frac{\pi r^4}{2}$
(c) $\frac{2}{5}Mr^2$ (d) $\frac{2}{3}Mr^2$
(e) $\frac{Mr^2}{2}$.

10.68. Angle of friction is the
(a) angle between normal reaction and the resultant of normal reaction and the limiting friction

(*b*) ratio of limiting friction and normal reaction
(*c*) the ratio of minimum friction force to the friction force acting when the body is just about to move
(*d*) the ratio of minimum friction force to friction force acting when the body is in motion
(*e*) ratio of static and dynamic friction.

10.69. The coefficient of friction depends on
(*a*) area of contact
(*b*) shape of surfaces
(*c*) strength of surfaces
(*d*) nature of surface
(*e*) all of the above.

10.70. Least force required to draw a body up the inclined plane is *W* sin (plane inclination + friction angle) applied in the direction
(*a*) along the plane
(*b*) horizontally
(*c*) vertically
(*d*) at an angle equal to the angle of friction to the inclined plane
(*e*) unpredictable.

10.71. The ratio of limiting friction and normal reaction is known as
(*a*) coefficient of friction
(*b*) angle of friction
(*c*) angle of repose
(*d*) sliding friction
(*e*) friction resistance.

10.72. Which one of the following statements is not correct
(*a*) the tangent of the angle of friction is equal to coefficient of friction
(*b*) the angle of repose is equal to angle of friction
(*c*) the tangent of the angle of repose is equal to coefficient of friction
(*d*) the sine of the angle of repose is equal to coefficient to friction
(*e*) none of the above.

10.73. On a ladder resting on smooth ground and leaning against vertical wall, the force of friction will be
(*a*) towards the wall at its upper end
(*b*) away from the wall at its upper end
(*c*) upwards at its upper end
(*d*) downwards at its upper end
(*e*) none of the above.

10.74. On the ladder resting on the ground and leaning against a smooth vertical wall, the force of friction will be
(*a*) downwards at its upper end
(*b*) upwards at its upper end
(*c*) perpendicular to the wall at its upper end
(*d*) zero at its upper end
(*e*) none of the above.

10.75. The velocity of a body on reaching the ground from a height *h*, is given by
(*a*) $v = 2gh$ (*b*) $v = 2gh^2$
(*c*) $v = \sqrt{2gh}$ (*d*) $v = 1/\sqrt{2gh}$
(*e*) $v = \frac{h^2}{2g}$.

10.76. Frictional force encountered after commencement of motion is called
(*a*) post friction
(*b*) limiting friction
(*c*) kinematic friction
(*d*) frictional resistance
(*e*) dynamic friction.

10.77. Coefficient of friction is the
(*a*) angle between normal reaction and the resultant of normal reaction and the limiting friction
(*b*) ratio of limiting friction and normal reaction
(*c*) the friction force acting when the body is just about to move
(*d*) the friction force acting when the body is in motion
(*e*) tangent of angle of repose.

10.78. Pick up wrong statement about friction force for dry surfaces. Friction force is
(*a*) proportional to normal load between the surfaces
(*b*) dependent on the materials of contact surface
(*c*) proportional to velocity of sliding
(*d*) independent of the area of contact surfaces
(*e*) none of the above is wrong statement.

10.79. A body of weight *W* on inclined plane of α being pulled up by a horizontal force *P* will be on the point of motion up the plane when *P* is equal to
(*a*) W (*b*) $W \sin(\alpha + \phi)$
(*c*) $W \tan(\alpha + \phi)$ (*d*) $W \tan(\alpha - \phi)$

(*e*) $W \tan \alpha$.

10.80. A particle moves along a straight line such that distance (x) traversed in t seconds is given by $x = t^2 (t - 4)$, the acceleration of the particle will be given by the equation
(*a*) $3t^2 - 2t$ (*b*) $3t^2 + 2t$
(*c*) $6t - 8$ (*d*) $6t - 4$
(*e*) $6t^2 - 8t$.

10.81. If rain is falling in the opposite direction of the movement of a pedestrain, he has to hold his umbrella
(*a*) more inclined when moving
(*b*) less inclined when moving
(*c*) more inclined when standing
(*d*) less inclined when standing
(*e*) none of the above.

10.82. Cartesian equation of a trajectory is
(*a*) $y = x \sin \alpha - \dfrac{gx^2}{2u^2 \sin^2 \alpha}$
(*b*) $y = x \tan \alpha - \dfrac{gx^2}{2u^2 \tan^2 \alpha}$
(*c*) $y = x \tan a - \dfrac{gx^2}{2u^2 \cos^2 \alpha}$
(*d*) $y = x \tan \alpha + \dfrac{gx^2}{2u^2 \cos^2 \alpha}$
(*e*) $y = x \tan \alpha + \dfrac{gx^2}{2u^2 \sin^2 \alpha}$.

10.83. Total time (t) of the flight of a projectile on a horizontal plane is equal to u = velocity of projection, x = angle of projection
(*a*) $t = \dfrac{2u \sin \alpha}{g}$ (*b*) $t = \dfrac{2u \cos \alpha}{g}$
(*c*) $t = \dfrac{2u \tan \alpha}{g}$ (*d*) $t = \dfrac{2u \cot \alpha}{g}$
(*e*) none of the above.

10.84. The escape velocity from the surface of the earth is approximately equal to
(*a*) 9.81 km/sec (*b*) 11.2 km/sec
(*c*) 14 km/sec (*d*) 22 km/sec
(*e*) none of the above.

10.85. For maximum range of a projectile, the angle of projection should be
(*a*) 30° (*b*) 45°
(*c*) 60° (*d*) 36°
(*e*) 90°.

10.86. A projectile is fired at an angle θ to the vertical. Its horizontal range will be maximum when θ is
(*a*) 0° (*b*) 30°
(*c*) 45° (*d*) 60°
(*e*) 90°.

10.87. If the velocity of projection is u m/sec and the angle of projection is $\alpha°$, the maximum height of the projectile on a horizontal plane is
(*a*) $\dfrac{u^2 \cos^2 \alpha}{2g}$ (*b*) $\dfrac{u^2 \sin^2 \alpha}{2g}$
(*c*) $\dfrac{u^2 \tan^2 \alpha}{2g}$ (*d*) $\dfrac{u^2 \sin^2 \alpha}{g}$
(*e*) $\dfrac{u \sin \alpha}{g}$.

10.88. Limiting force of friction is the
(*a*) tangent of angle between normal reaction and the resultant of normal reaction and limiting friction
(*b*) ratio of limiting friction and normal reaction
(*c*) the friction force acting when the body is just about to move
(*d*) the friction force acting when the body is in motion
(*e*) minimum force of friction.

10.89. Coulomb friction is the friction between
(*a*) bodies having relative motion
(*b*) two dry surfaces
(*c*) two lubricated surfaces
(*d*) solids and liquids
(*e*) electrically charged particles.

10.90. Dynamic friction as compared to static friction is
(*a*) same
(*b*) more
(*c*) less
(*d*) may be less of more depending on nature of surfaces and velocity
(*e*) has no correlation.

10.91. Two bodies of 100 kg and 400 kg are resting on two inclined planes α and β towards each other and the bodies are joined together by a string passing over a pulley connected at the top of inclined planes. Coefficient of friction for two bodies with their inclined planes are μ_1 and μ_2. Tension in string will be

(a) 100 kg (b) 300 kg
(c) 400 kg (d) 500 kg
(e) 600 kg.

10.92. Tangent of angle of friction is equal to
(a) kinetic friction
(b) limiting friction
(c) angle of repose
(d) coefficient of friction
(e) friction force.

10.93. Kinetic friction is the
(a) tangent of angle between normal reaction and the resultant of normal reaction and the limiting friction
(b) ratio of limiting friction and normal reaction
(c) the friction force acting when the body is just about to move
(d) the friction force acting when the body is in motion
(e) dynamic friction.

10.94. The effort required to be applied parallel to plane, to move a body of weight W upon rough inclined plane (μ = coeff. of friction $=\tan\phi$) with inclination α to horizontal is
(a) $W\tan\alpha$ (b) $W\tan(\alpha+\phi)$
(c) $W\tan(\alpha-\phi)$
(d) $W(\sin\alpha+\mu\cos\alpha)$
(e) $W(\cos\alpha+\mu\sin\alpha)$.

10.95. The effort required to lift a load W on a screw jack with helix angle α and angle of friction ϕ is equal to
(a) $W\tan(\alpha+\phi)$
(b) $W\tan(\alpha-\phi)$
(c) $W\cos(\alpha+\phi)$
(d) $W\sin(\alpha+\phi)$
(e) $W(\sin\alpha+\cos\phi)$.

10.96. A semi-circular disc rests on a horizontal surface with its top flat surface horizontal and circular portion touching down. The coefficient of friction between semi-cricular disc and horizontal surface is μ. This disc is to be pulled by a horizontal force applied at one edge and it always remains horizontal. When the disc is about to start moving, its top horizontal force will
(a) remain horizontal
(b) slant up towards direction of pull
(c) slant down towards direction of pull
(d) unpredictable
(e) none of the above.

10.97. A particle inside a hollow sphere of radius r, having coefficient of friction $\frac{1}{\sqrt{3}}$ can rest upto height of
(a) $r/2$ (b) $r/4$
(c) $r/8$ (d) $0.134\,r$
(e) $3r/8$.

10.98. The algebraic sum of moments of the forces forming couple about any point in their plane is
(a) equal to the moment of the couple
(b) constant
(c) both of above are correct
(d) both of above are wrong
(e) none of the above.

10.99. A single force and a couple acting in the same plane upon a rigid body
(a) balance each other
(b) cannot balance each other
(c) produce moment of a couple
(d) are equivalent
(e) none of the above.

10.100. If three forces acting in one plane upon a rigid body, keep it in equilibrium, then they must either
(a) meet in a point
(b) be all parallel
(c) at least two of them must meet
(d) all the above are correct
(e) none of the above.

10.101. The maximum frictional force which comes into play when a body just begins to slide over another surface is called
(a) limiting friction
(b) sliding friction
(c) rolling friction
(d) kinematic friction
(e) dynamic friction.

10.102. The co-efficient of friction depends upon
(a) nature of surfaces
(b) area of contact
(c) shape of the surfaces
(d) all of the above.
(e) (a) and (b) above.

10.103. According to parallel axis theorem for a plane area A, the M.I. about the axes XX and YY separated by distance r,
(a) $I_y=I_x+Ar^2$ (b) $I_y=I_x-Ar^2$

(*c*) $I_x + I_y = Ar^2$ (*d*) $\frac{I_x}{I_y} = Ar^2$

(*e*) $I_y = \frac{I_x}{Ar^2}$.

10.104. The necessary condition for forces to be in equilibrium is that these should be
(*a*) coplanar
(*b*) meet at one point
(*c*) both (*a*) and (*b*) above
(*d*) all be equal (*e*) something else.

10.105. If three forces acting in different planes can be represented by a triangle, these will be in
(*a*) non-equilibrium
(*b*) partial equilibrium
(*c*) full equilibrium
(*d*) unpredictable
(*e*) none of the above.

10.106. If n = number of members and j = number of joints, then for a perfect frame, n =
(*a*) $j - 2$ (*b*) $2j - 1$
(*c*) $2j - 3$ (*d*) $3j - 2$
(*e*) $2j - 4$.

10.107. A body moves, from rest with a constant acceleration of 5 m per sec. The distance covered in 5 sec is most nearly
(*a*) 38 m (*b*) 62.5 m
(*c*) 96 m (*d*) 124 m
(*e*) 240 m.

10.108. A flywheel on a motor goes from rest to 1000 rpm in 6 sec. The number of revolutions made is nearly equal to
(*a*) 25 (*b*) 50
(*c*) 100 (*d*) 250
(*e*) 500.

10.109. $y^2 = \frac{9}{16}x^2 - 36$ is the equation of a
(*a*) cricle (*b*) ellipse
(*c*) parabola (*d*) hyperbola
(*e*) spiral of Archimedes.

10.110. Which of the following is the locus of a point that moves in such a manner that its distance from a fixed point is equal to its distance from a fixed line multiplied by a constant greater than one
(*a*) ellipse (*b*) hyperbola
(*c*) parabola (*d*) circle
(*e*) none of the above.

10.111. Which of the following is not the unit of energy
(*a*) kg m (*b*) kcal
(*c*) watts (*d*) watt hours
(*e*) kg m × (m/sec)^2.

10.112. A sample of metal weighs 219 gms in air, 180 gms in water, 120 gms in an unknown fluid. Then which is correct statement about density of metal
(*a*) density of metal can't be determined
(*b*) metal is twice as dense as water
(*c*) metal will float in water
(*d*) metal is twice as dense as unknown fluid
(*e*) none of the above.

10.113. The C.G. of a solid hemisphere lies on the central radius
(*a*) at distance $\frac{3r}{2}$ from the plane base
(*b*) at distance $\frac{3r}{4}$ from the plane base
(*c*) at distance $\frac{3r}{5}$ from the plane base
(*d*) at distance $\frac{3r}{8}$ from the plane base
(*e*) at distance $\frac{r}{2}$ from the plane base.

10.114. The C.G. of a trapezium of base '*b*', height '*h*' and upper side '*a*' lies at following distance from the base
(*a*) $\frac{h}{3}\left(\frac{2a+b}{a+b}\right)$ (*b*) $\frac{h}{3}\left(\frac{a+b}{2a+b}\right)$
(*c*) $\frac{h}{3}\left(\frac{a+2b}{a+b}\right)$ (*d*) $\frac{h}{2}\left(\frac{2a+b}{a+b}\right)$
(*e*) $\frac{h}{4}\left(\frac{2a+b}{a+b}\right)$.

10.115. The C.G. of an isosceles triangle with base '*a*' and other sides '*b*' lies at following distance from the base
(*a*) $\frac{\sqrt{4a^2 - b^2}}{6}$ (*b*) $\frac{\sqrt{a^2 - b^2}}{6}$
(*c*) $\frac{\sqrt{2a^2 - a^2}}{6}$ (*d*) $\frac{\sqrt{a^2 - 2b^2}}{6}$
(*e*) $\frac{\sqrt{4a^2 - b^2}}{3}$.

10.116. According to theorem of perpenaicular axes, if I_{xx} and I_{yy} be the M.I. of a lamina

about xx and yy axes, then M.I. of the lamina about axis zz, which is perpendicular to xx and yy, equal to
(*a*) $I_{xx} + I_{yy}$ (*b*) $I_{xx} \times I_{yy}$
(*c*) $\frac{I_{xx}}{I_{yy}}$ (*d*) $\frac{I_{yy}}{I_{xx}}$
(*e*) $\sqrt{I_{xx}^2 + I_{yy}^2}$.

10.117. The C.G. of a plane lamina will not be at its geometrical centre in the case of a
(*a*) right angled triangle
(*b*) equilateral triangle
(*c*) square (*d*) circle
(*e*) rectangle.

10.118. Moment of inertia of a rectangular area of base b and height d about x-axis is given by
(*a*) $\frac{bd^3}{3}$ (*b*) $\frac{bd^3}{4}$
(*c*) $\frac{bd^3}{6}$ (*d*) $\frac{bd^3}{12}$
(*e*) $\frac{bd^3}{8}$.

10.119. The C.G. of a right circular solid cone of height h lies at the following distance from the base
(*a*) $h/2$ (*b*) $h/3$
(*c*) $h/6$ (*d*) $h/4$
(*e*) $3h/5$.

10.120. Moment of inertia of a circular area, whose diameter is d, about an axis perpendicular to the area, passing through its centre is given by
(*a*) $\frac{\pi d^4}{64}$ (*b*) $\frac{\pi d^4}{32}$
(*c*) $\frac{\pi d^4}{12}$ (*d*) $\frac{\pi d^4}{16}$
(*e*) $\frac{\pi d^4}{24}$.

10.121. M.I. of a hollow circular cross section (inside diameter d and outside diameter D) about horizontal axis is
(*a*) $\frac{\pi}{16}(D^4 - d^4)$ (*b*) $\frac{\pi}{16(D^3} - d^3)$
(*c*) $\frac{\pi}{32}(D^4 - d^4)$ (*d*) $\frac{\pi}{64}(D^4 - d^4)$
(*e*) $\frac{\pi}{64}(D^3 - d^3)$.

10.122. The M.I. of hollow circular section about a central axis perpendicular to section as compared to its M.I. about horizontal axis is
(*a*) same (*b*) double
(*c*) half (*d*) four times
(*e*) one fourth.

10.123. Moment of inertia of a right circular cylinder of radius r and mass M about its axis is given by
(*a*) Mr^2 (*b*) $\frac{Mr^2}{2}$
(*c*) $\frac{Mr^2}{4}$ (*d*) $\frac{Mr^2}{12}$
(*e*) $\frac{Mr^2}{3}$.

10.124. Moment of inertia of a triangle of base a and height h, about the base is given by
(*a*) $\frac{ah^3}{6}$ (*b*) $\frac{ah^3}{12}$
(*c*) $\frac{ah^2}{6}$ (*d*) $\frac{ah^2}{12}$
(*e*) $\frac{ah^3}{3}$

10.125. M.I. of a triangular section of base a and height h about an axis passing through its c.g. and parallel to base is
(*a*) $\frac{ah^3}{8}$ (*b*) $\frac{ah^3}{12}$
(*c*) $\frac{ah^3}{36}$ (*d*) $\frac{ah^3}{24}$
(*e*) $\frac{ah^3}{48}$

10.126. Which of the following is the example of lever of first order
(*a*) arm of man
(*b*) pair of scissors
(*c*) pair of clinical tongs
(*d*) all of the above
(*e*) none of the above.

10.127. A pair of smith's tongs is an example of the lever of
(*a*) zeroth order (*b*) first order
(*c*) second order (*d*) third order
(*e*) fourth order.

10.128. In the lever of third order, load W, effort P and fulcrum F are oriented as follows

(a) W between P and F
(b) F between W and P
(c) P between W and F
(d) W, P and F all on one side
(e) none of the above.

10.129. The angle which an inclined plane makes with the horizontal when a body placed on it is about to move down is known as angle of
(a) friction (b) limiting friction
(c) repose (d) kinematic friction
(e) static friction.

10.130. In actual machines
(a) mechanical advantage is greater than velocity ratio
(b) mechanical advantage is equal to velocity ratio
(c) mechanical advantage is less than velocity ratio
(d) mechanical advantage is unity
(e) none of the above.

10.131. In ideal machines
(a) mechanical advantage is greater than velocity ratio
(b) mechanical advantage is equal to velocity ratio
(c) mechanical advantage is less than velocity ratio
(d) mechanical advantage is unity
(e) none of the above.

10.132. The velocity ratio in case of an inclined plane inclined at angle θ to horizontal and weight being pulled up the inclined plane by vertical effort is
(a) $\sin\theta$ (b) $\frac{1}{\sin\theta}$
(c) $\frac{1}{\cos\theta}$ (d) $\tan\theta$
(e) $\frac{1}{\tan\theta}$.

10.133. When P is the effort and W is the load then linear law of machines is given by the relation
(a) $W = mP + c$ (b) $W = mP - c$
(c) $P = mW - c$ (d) $P = mW + c$
(e) $P = c - mW$
where m and c are constants.

10.134. In a simple screw Jack the pitch of the screw is 9 mm and the length of the handle operating the screw is 45 cm, then the velocity ratio of system will be
(a) 5 (b) 157
(c) 314 (d) 15.7
(e) 31.4.

10.135. The equation of the catenary in cartesian form is
(a) $y = c\cosh\frac{x}{c}$ (b) $y = c\sinh\frac{x}{c}$
(c) $y = \cosh^{-1}\frac{x}{c}$ (d) $y = c\sinh^{-1}\frac{x}{c}$
(e) none of the above.

10.136. A cable with a uniformly distributed load per horizontal metre run will take the following shape
(a) straight line (b) parabola
(c) hyperbola (d) elliptical
(e) part of a circle.

10.137. If V be the vertical load at the support end and H the horizontal tension then the maximum tension in the string is equal to
(a) $V + H$ (b) $\frac{V+H}{2}$
(c) $\sqrt{V+H}$ (d) $\sqrt{V^2 + H^2}$
(e) $\sqrt{V^2 - H^2}$.

10.138. Tension in a string is maximum at
(a) left support (b) right support
(c) mid way (d) quarter span
(e) three quarter span.

10.139. Whenever two elastic bodies collide with each other, the phenomenon of collision takes because the two bodies
(a) immediately, after collision come momentarily to rest
(b) tend to compress each other till they are compressed the maximum possible
(c) attempt to regain the original shape due to their elasticity
(d) all of the above
(e) none of the above.

10.140. Fig. 10.2 shows a ball in equilibrium under the action of vertical and horizontal supports and also supported by a string SG. Obviously the resultant of forces R_H, R_V and S will be equilibriant of W. The magnitudes R_H, R_V and S will be
(a) $R_H = R_V = S = W$

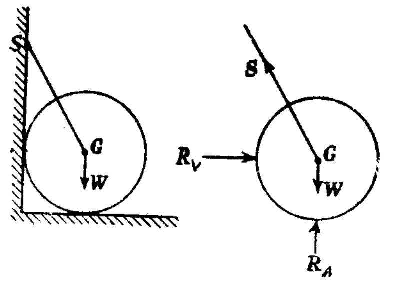

Fig. 10.2.

(*b*) $R_V = 0, R_H = W$ and $S = 0$
(*c*) $R_V = R_H = W$ and $S = 0$
(*d*) $R_V = R_H = 0$ and $S = W$
(*e*) these can't be determined definitely.

10.141. A ball is resting on two planes *OA* and *OB* inclined at 30° and 45° respectively as shown in Fig. 10.3. The reaction on plane *OA* will be

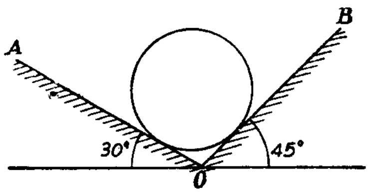

Fig. 10.3.

(*a*) greater than on *OB*
(*b*) less than on *OB*
(*c*) equal to that on *OB*
(*d*) will depend on weight and size of ball
(*e*) none of the above.

10.142. The minimum coefficient of friction between a sphere and inclined plane of θ, so that the sphere may roll without slipping is

(*a*) $\tan\theta$ (*b*) $\frac{1}{2}\tan\theta$
(*c*) $\frac{2}{7}\tan\theta$
(*d*) $\frac{1}{7}\tan\theta$
(*e*) $\frac{3}{7}\tan\theta$.

10.143. A circular roller of weight *W* is hanging by a tie rod and resting against a smooth vertical wall as shown in Fig. 10.4. The tension in tie rod will be

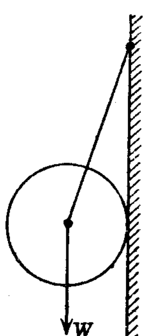

Fig. 10.4.

(*a*) equal to *W*
(*b*) less than *W*
(*c*) greater than *W*
(*d*) data are insufficient to determine it
(*e*) none of the above.

10.144. The force induced in member *AB* due to load *W* in Fig. 10.5 will be

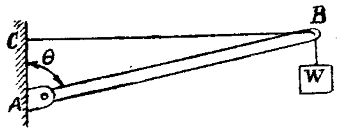

Fig. 10.5.

(*a*) $W \operatorname{cosec}\theta$ (*b*) $W \sec\theta$
(*c*) $W \tan\theta$ (*d*) $W \cos\theta$
(*e*) none of the above.

10.145. The force induced in string *BC* due to load *W* in Fig. 10.5 will be
(*a*) $W \operatorname{cosec}\theta$ (*b*) $W \sec\theta$
(*c*) $W \tan\theta$ (*d*) $W \cot\theta$
(*e*) none of the above.

10.146. The force induced in string *BC* due to load *W* in Fig. 10.6 will be

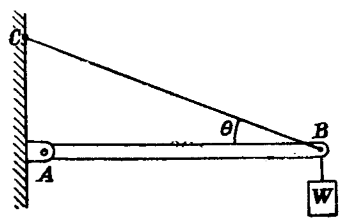

Fig. 10.6.

(*a*) $W \operatorname{cosec}\theta$ (*b*) $W \sec\theta$
(*c*) $W \tan\theta$ (*d*) $W \cot\theta$
(*e*) none of the above.

10.147. The force induced in member *AB* due to load *W* in Fig. 10.7 will be
(*a*) $W \operatorname{cosec}\theta$ (*b*) $W \sec\theta$
(*c*) $W \tan\theta$ (*d*) $W \cot\theta$
(*e*) none of the above.

10.148. Two identical rollers of equal weight are supported as shown in Fig. 10.7. The maximum

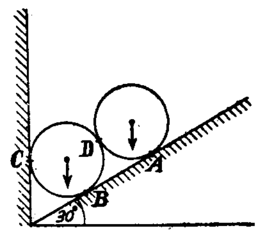

Fig. 10.7.

reaction will occur at
(*a*) point *A* (*b*) point *B*
(*c*) point *C* (*d*) point *D*
(*e*) data are insufficient.

10.149. A chord *ABC* is attached at two points *A* and *C* on two vertical walls. *A* pulley *B* of infinitesimally small radius carries a load *W* and is free to roll without friction along the chord. Tension in *AB* compared to *BC* will be
(*a*) greater (*b*) lower
(*c*) equal (*d*) unpredictable
(*e*) none of the above.

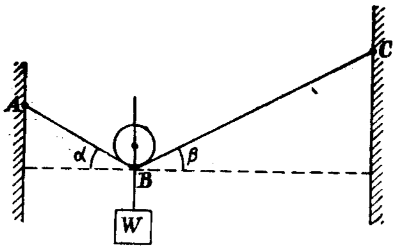

Fig. 10.8.

10.150. In Fig. 10.8, angle α compared to β will be
(*a*) greater (*b*) lower
(*c*) equal (*d*) unpredictable
(*e*) none of the above.

10.151. A horizontal force *F* acts at hinge *C* of the bars of system shown in Fig. 10.9.
The force induced in bar *CD* will be

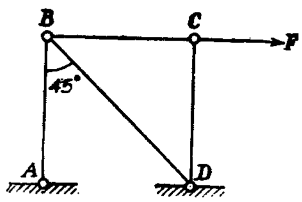

Fig. 10.9.

(*a*) F (*b*) $\sqrt{2}F$
(*c*) $F/\sqrt{2}$ (*d*) zero
(*e*) none of the above.

10.152. In Fig. 10.9, force induced in member *AB* will be
(*a*) *F*, tensile
(*b*) *F*, compressive
(*c*) $F/\sqrt{2}$, tensile
(*d*) $F/\sqrt{2}$, compressive
(*e*) $\sqrt{2}F$, tensile.

10.153. In Fig. 10.9, force induced in member *BD* will be
(*a*) $\sqrt{2}F$, tensile (*b*) $\sqrt{2}F$, compressive
(*c*) *F*, tensile (*d*) *F*, compressive
(*e*) $F/\sqrt{2}$, compressive.

10.154. A hinged square *ABCD* with diagonal *BD* is subjected to equal and opposite forces *F* at each corner as shown in Fig. 10.10.
Forces induced in members *AB, BC, CD* and *DA* will be

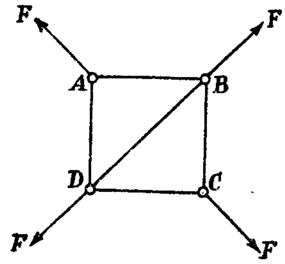

Fig. 10.10.

(*a*) *F*, tension (*b*) *F*, compression
(*c*) $F/\sqrt{2}$, tension (*d*) $F/\sqrt{2}$, compression
(*e*) $\sqrt{2}F$, tension

10.155. In Fig. 10.10, force induced in member *BD* will be
(*a*) *F*, tension (*b*) *F*, compression
(*c*) $F/\sqrt{2}$, tension (*d*) $F/\sqrt{2}$, compression
(*e*) $\sqrt{2}\,F$, tension

10.156. A prismatic bar *AB* is supported at its end by a smooth semi-circular trough as shown in Fig. 10.11 and is lying in a vertical plane normal to the axis of the trough. The reactions at point *A* and *B* will be acting

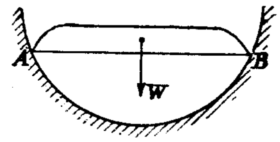

Fig. 10.11.

(*a*) horizontally
(*b*) vertically
(*c*) along *AB*
(*d*) normal to the surface at point of contact
(*e*) none of the above.

10.157. A lever *AB* is supported at hinge *C* and acted on by forces *P* and *Q* as shown in Fig. 10.12. The reaction at *C* will be along
(*a*) direction of *P*
(*b*) direction of *Q*

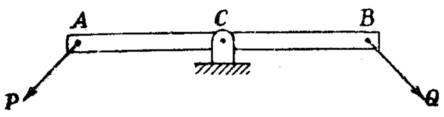

Fig. 10.12.

(c) perpendicular to AB
(d) pass through C and the point of intersection of the forces P and Q
(e) none of the above.

10.158. A 60 kg man stands on the middle of a 20 kg ladder as shown in Fig. 10.13, Reaction at A will be

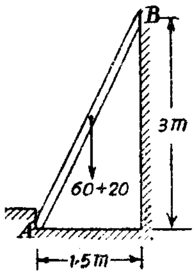

Fig. 10.13.

(a) 80 kg
(b) 40 kg
(c) 83.4 kg
(d) 100 kg
(e) none of the above.

10.159. A prismatic bar AB of weight W and length l is hinged at A and supported at B as shown in Fig. 10.14. Reaction at B will be

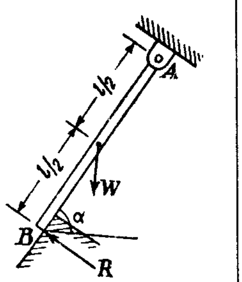

Fig. 10.14.

(a) W
(b) $W \cos x$
(c) $W \cos x$
(d) $\frac{W}{S} \cos x$
(e) $2W \cos x$

10.160. A ladder resting against a wall will never slip irrespective of where man stands on it, if the ladder makes an angle
(a) not greater than friction angle with vertical
(b) equal to friction angle with vertical
(c) greater than friction angle with vertical
(d) any angle irrespective of friction angle
(e) none of the above.

10.161. A locomotive of weight W is pulled by a force P just equal to the total friction at the points of contact A and B. The vertical reaction R_A and R_B respectively will be

(a) $\frac{W}{2} + \frac{Pb}{2a}$, and $\frac{W}{2} - \frac{Pb}{2a}$

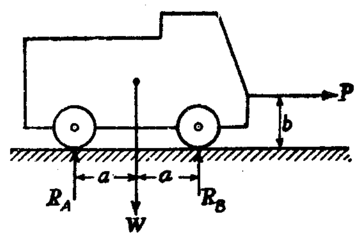

Fig. 10.15.

(b) $W/2$ each
(c) $\frac{W}{2} - \frac{Pb}{2a}$, and $\frac{W}{2} + \frac{Pb}{2a}$
(d) $\frac{W}{2} + \frac{Pb}{2a}$ each
(e) $\frac{W}{2} - \frac{Pb}{2a}$ each.

10.162. A weight W is supported by the two cables as shown in Fig. 10.16. For what value of θ the tension in cable making angle θ will be minimum

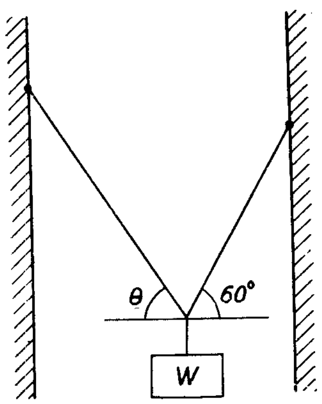

Fig. 10.16.

(a) 30° (b) 60°
(c) 45° (d) 0°
(e) data insufficient for solution.

10.163. A ladder AB weighing W kg is supported as shown in Fig. 10.17. The reaction at A will be
(a) W kg
(b) $\frac{W}{2}$ kg
(c) less than W kg
(d) more than W kg
(e) not possible to determine.

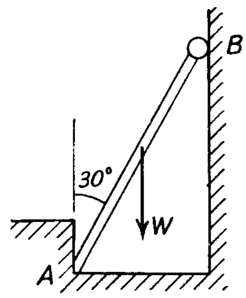

Fig. 10.17.

10.164. A ladder AB of weight W kg is supported as shown in Fig. 10.18. The reactions at A and B will be equal to

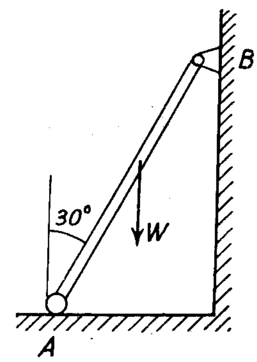

Fig. 10.18.

(a) W, W (b) $W, 0$
(c) $\frac{W}{2}, \frac{W}{2}$ (d) $\frac{W}{2}, 0$
(e) not possible to determine.

10.165. The total friction that can be developed is
(a) independent of the magnitude of the area of contact
(b) proportional to the magnitude of the area of contact
(c) proportional to square of area of contact
(d) unpredictable
(e) none of the above.

10.166. For low velocities of sliding, the total friction that can be developed is
(a) proportional to velocity
(b) proportional to square of velocity
(c) not dependent on velocity
(d) practically independent of the velocity
(e) none of the above.

10.167. A rectangular block of width w and height h is resting on a horizontal floor. It is to be avoided from overturning when a horizontal pull acts at any height on the block. This will be possible when
(a) $\frac{w}{h} > \mu$ (b) $\frac{w}{h} < \mu$
(c) $\frac{w}{2h} > \mu$ (d) $\frac{w}{2h} < \mu$
(e) none of the above.
(μ = coefficient of friction between block and ground

10.168. A man wishes to slide a heavy block over a concrete floor by a rope. At what angle (α) the rope should be inclined with the horizontal so that the man has to exert minimum force to pull it,
(a) $\alpha > \phi$ (b) $\alpha = \phi$
(c) $\alpha < \phi$
(d) any angle irrespective of ϕ
(e) all of the above.
(ϕ = angle of friction)

10.169. Two rectangular blocks of weight W each are connected by a flexible cord and rest upon a horizontal and an inclined plane with the cord passing over a pulley as

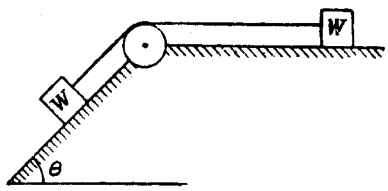

Fig. 10.19.

shown in Fig. 10.19. If μ is the coefficient of friction for all continuous surfaces, angle θ for motion of system to impede will be
(a) $\tan\theta = \mu$ (b) $\tan\theta/2 = \mu$
(c) $\tan 2\theta = \mu$ (d) $\tan\theta = 2\mu$
(e) $\tan\theta = \mu/2$.

10.170. A circular disc of weight W rolls down an inclined plane of inclination θ. If force of friction be F, then the total net force on the disc parallel to plane is equal to
(a) $W - F\sin\theta$ (b) $W\sin\theta - F$

(c) $W \cos\theta - F$ (d) $F \cos\theta - W$
(e) $W \tan\theta - F$.

10.171. A body of weight W is resting at a plane inclined at 30° to the horizontal. If it is attached to a string making an angle of 60° with horizontal, find the tension in the string, if the friction angle is 30°
(a) zero (b) $W/2$
(c) W (d) $2W$
(e) none of the above.

10.172. Two weights of $2W$ and W are connected by an inextensible string and rest on two inclined planes, inclined at 30° and 60° respectively as shown in Fig. 10.20. Angle α will be equal to

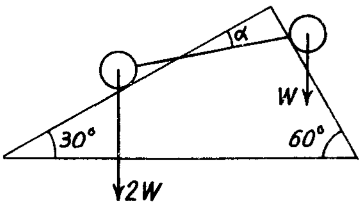

Fig. 10.20.

(a) 30° (b) 60°
(c) $\tan^{-1}\sqrt{3}$ (d) $\tan^{-1}\frac{\sqrt{3}}{2}$
(e) $\tan^{-1}\frac{2}{\sqrt{3}}$

10.173. A body is resting on a plane inclined at angle of 30° to horizontal. What force would be required to slide it down, if the coefficient of friction between body and plane is 0.3
(a) zero (b) 1 kg
(c) 5 kg
(d) would depend on weight of body
(e) none of the above.

10.174. Least force that starts a body along a plane acts at an angle with the plane
(a) equal to the angle of friction
(b) little more than angle of friction
(c) little less than angle of friction
(d) of zero degree
(e) none of the above.

10.175. A body weighing 100 kg falls vertically down on a cart weighing 200 kg moving at velocity V m/sec. The velocity of cart after falling of weight would be
(a) V m/sec
(b) more than V m/sec
(c) less than V m/sec
(d) unpredictable
(e) none of the above.

10.176. A weight W_1 on a smooth table is connected by a light cord passing over a smooth pulley to another weight W_2 which is free to move vertically. (Refer Fig. 10.21). The tension in the cord will be

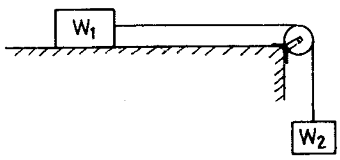

Fig. 10.21.

(a) W_1 (b) W_2
(c) $W_1 + W_2$ (d) $\frac{W_1 + W_2}{2}$
(e) $\frac{W_1 W_2}{W_1 + W_2}$.

10.177. A wedge with included angle θ is used to split logs. If α be the angle of friction between the wedge and the log, the maximum value of θ so that wedge will remain embedded in log is equal to
(a) α (b) 2α
(c) α/2 (d) $\sqrt{2}\alpha$
(e) $\alpha/\sqrt{2}$.

10.178. Fig. 10.22 shows a hoisting apparatus in which the spar AB 5 m long, is free to turn in a vertical plane through A and B and is fastened by a cable BC 3 m long, to a point C, 6 m vertically above. A weight of 1500 kg is supported by a cable at B. Neglecting the weight of the spar and the cables, the force along AB will be

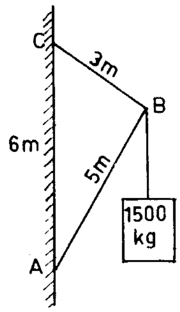

Fig. 10.22.

(a) 1500 kg (b) 1250 kg

(*c*) 1000 kg (*d*) 750 kg
(*e*) 2000 kg.

10.179. In the above problem 10.178 force along *BC* will be
(*a*) 1500 kg (*b*) 1250 kg
(*c*) 1000 kg (*d*) 750 kg
(*e*) 2000 kg.

10.180. A weight of 500 kg is held on a smooth plane, inclined at 30° to the horizontal by a force *P* acting 30° above the plane as shown in Fig. 10.23.

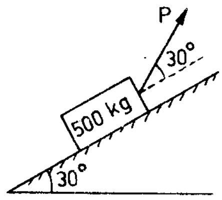

Fig. 10.23.

The reaction of plane on the weight will be
(*a*) 500 kg (*b*) 250 kg
(*c*) 476 kg (*d*) 288 kg
(*e*) none of the above.

10.181. In problem 10.180, the force *P* should be
(*a*) 500 kg (*b*) 250 kg
(*c*) 476 kg (*d*) 288 kg
(*e*) none of the above.

10.182. In Prob. 10.180, if the angle of friction be 30°, then force *P* would be
(*a*) 500 kg (*b*) 250 kg
(*c*) 476 kg (*d*) 288 kg
(*e*) none of the above.

10.183. A uniform bar *AB* of weight 100 kg is hinged at *A* to a vertical wall and held in horizontal position by a cord *BC* (Fig. 10.24). The tension in the cord *BC* will be

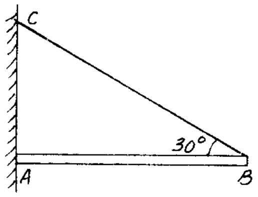

Fig. 10.24.

(*a*) 100 kg (*b*) 50 kg
(*c*) 200 kg (*d*) 150 kg
(*e*) unpredictable.

10.184. In above problem 10.183 the reaction on the bar of the hinge at *A* will be
(*a*) 100 kg (*b*) 50 kg
(*c*) 200 kg (*d*) 50 kg
(*e*) unpredictable.

10.185. Fig. 10.25 shows a bar *AB* resting against smooth surfaces at *A* and *B*. The reaction at *B* will be in the direction

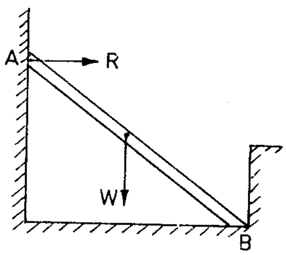

Fig. 10.25.

(*a*) horizontal
(*b*) vertical
(*c*) along bar *BA*
(*d*) inclined in a line joining point *B* and the point where forces *R* and *W* meet
(*e*) unpredictable.

10.186. If a body is transmitting torque *T* kgm at angular speed of θ radians/sec, then h.p. transmitted will be
(*a*) $T\theta$ (*b*) T/θ
(*c*) $\frac{T\theta}{102}$ (*d*) $T\theta/75$
(*e*) $75\,T\theta$.

10.187. A conical pendulum consisting of a weight *W* suspended from a cord is made to rotate in a horizontal circle about a vertical axis with a constant angular velocity of ω rad/sec. Tension in cord is equal to

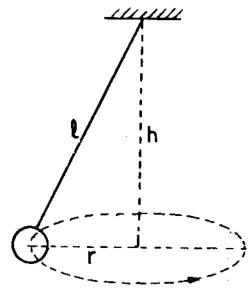

Fig. 10.26.

(*a*) $\frac{W}{g} \times l\omega^2$ (*b*) $\frac{W}{g} \times \frac{l}{\omega^2}$
(*c*) $\frac{2W}{g} l\omega^2$ (*d*) $\frac{W}{2g} \frac{l}{\omega^2}$
(*e*) none of the above.

10.188. Fig. 10.27 shows a weight of 20 kg suspended at one end of cord and a force of 30 kg applied at other end of cord passing over a pulley. Neglecting weight of rope and pulley, tension in cord will be

(*a*) 30 kg
(*b*) 20 kg
(*c*) 10 kg
(*d*) 50 kg
(*e*) 25 kg.

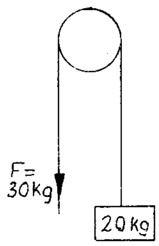

Fig. 10.27

10.189. If in problem 10.188, the force of 30 kg be replaced by a weight of 30 kg, then the tension in cord will be

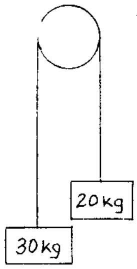

Fig. 10.28.

(*a*) 30 kg (*b*) 20 kg
(*c*) 30 – 20 = 10 kg
(*d*) 30 + 20 = 50 kg
(*e*) 24 kg.

10.190. If a body is transmitting torque *T* kg m at *N* rpm, then h.p. transmitted will be

(*a*) TN (*b*) $\frac{TN}{75}$
(*c*) $\frac{TN}{4500}$ (*d*) $\frac{2\pi NT}{75}$
(*e*) $\frac{2\pi NT}{4500}$.

10.191. A freight car weighing 50,000 kg is moving with a velocity of one m/sec when it strikes a bumping post. If the draw bar spring on the car takes all of the compression, and the deflection is not to be more than 10 cm, then scale of spring should be approximately equal to

(*a*) 50×10^4 kg/cm
(*b*) 100×10^4 kg/cm
(*c*) 25×10^4 kg/cm
(*d*) 250×10^4 kg/cm
(*e*) not possible to determine.

10.192. A barge is pulled by two tugboats as shown in Fig. 10.29. The resultant of the forces exerted by the tugboats is 1000 kg force. What will be the value of θ so that tension in rope 2 is minimum ?

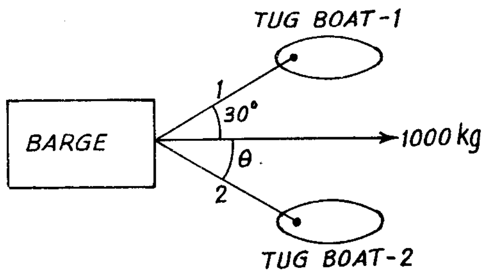

Fig. 10.29.

(*a*) 30° (*b*) 45°
(*c*) 60° (*d*) 0°
(*e*) 90°.

10.193. Fig. 10.30 shows a load on a frictionless inclined plane of θ, A force *F* inclined at angle α to horizontal is to be applied to maintain the load in equilibrium. The value of α for *F* to be minimum is

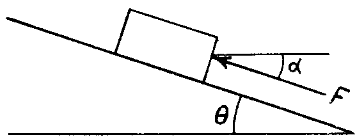

Fig. 10.30.

(*a*) θ (*b*) 90° – θ
(*c*) 0 (*d*) θ/2
(*e*) data are inadequate for solution.

10.194. If a mass of 20 kg falling from a height of 1.0 m from rest is brought to rest by penetrating into sand by 1 m then average resistance offered by sand is

(*a*) 100 kg (*b*) 110 kg
(*c*) 150 kg (*d*) 200 kg
(*e*) 50 kg.

10.195. A body weighing 1000 kg falls 8 cm and strikes a 500 kg/cm spring. The deformation of spring will be

(*a*) 8 cm (*b*) 4 cm
(*c*) 16 cm (*d*) 2 cm
(*e*) not possible to determine.

10.196. An elevator weighing 1000 kg attains an upward velocity of 4 m/sec in two sec with uniform acceleration. The tension in the supporting cables will be

(*a*) 1000 kg (*b*) 800 kg
(*c*) 1200 kg (*d*) 2000 kg
(*e*) not possible to determine.

10.197. If in the above problem, 10.196, the tension be reduced so that the elevator comes to rest in a distance of 2 m, then tension in the cable will be
(*a*) 1000 kg (*b*) 500 kg
(*c*) 0 kg (*d*) 590 kg
(*e*) not possible to determine.

10.198. Which of the following is the unit of energy
(*a*) jouls
(*b*) N-m
(*c*) electron-volt
(*d*) all of the above
(*e*) none of the above.

10.199. A 13 m ladder is placed against a smooth vertical wall with its lower end 5 m from the wall. What should be the coefficient of friction between ladder and floor so that it remains in equilibrium
(*a*) 0.1 (*b*) 0.15
(*c*) 0.2 (*d*) 0.21
(*e*) 0.22.

10.200. The tension in the cable supporting a lift is more when the lift is
(*a*) moving downwards with uniform velocity
(*b*) moving upwards with uniform velocity
(*c*) stationary
(*d*) moving upwards with acceleration
(*e*) moving downwards with uniform velocity.

10.201. If the tension in the cable supporting the lift moving upwards is twice the tension when the lift is moving downwards, the acceleration of the lift is equal to
(*a*) $\frac{g}{2}$ (*b*) $\frac{g}{3}$
(*c*) $\frac{g}{4}$ (*d*) $\frac{g}{5}$
(*e*) g.

10.202. When a body slides down an inclined surface, the acceleration (f) of the body is given by
(*a*) $f = g$ (*b*) $f = g \sin\theta$
(*c*) $f = g \cos\theta$ (*d*) $f = g \tan\theta$
(*e*) $f = g/\sin\theta$.

10.203. A particle while sliding down a smooth plane of $19.86\sqrt{2}$ m length acquires a velocity of 19.86 m/sec. The inclination of plane is
(*a*) 30° (*b*) 45°
(*c*) 60° (*d*) 75°
(*e*) none of the above.

10.204. A man wishes to move a block of size 2 m × 2 m, weighing 100 kg. Coefficient of friction between block and floor is 0.3. How he can move it with least effort ?
(*a*) slide along ground by pushing
(*b*) tip it over
(*c*) it is not possible to move it
(*d*) pull it
(*e*) none of the above.

10.205. The product of mass and velocity is known as
(*a*) work (*b*) moment
(*c*) impulse (*d*) momentum
(*e*) power.

10.206. For a machine to be self-locking, its efficiency should be
(*a*) 100%
(*b*) less than 67%
(*c*) less than 50%
(*d*) more than 50%
(*e*) none of the above.

10.207. Efficiency of a screw jack with helix angle α and coefficient of friction μ is equal to
(*a*) $\frac{\tan\alpha}{\tan(\alpha-\phi)}$ (*b*) $\frac{\tan(\alpha+\phi)}{\tan\alpha}$
(*c*) $\frac{\tan(\alpha-\phi)}{\tan\alpha}$ (*d*) $\frac{\tan\alpha}{\tan(\alpha+\phi)}$
(*e*) $\frac{\tan\alpha}{\tan\alpha+\tan\phi}$

10.208. The efficiency of a screw jack is maximum when its helix angle α is equal to
(*a*) $45° - \phi/2$ (*b*) $45° + \phi/2$
(*c*) $22\frac{1}{2}° + \phi/2$ (*d*) $90° - \phi$
(*e*) $45° - \phi/4$.

10.209. Maximum efficiency of a screw jack for angle of friction ϕ is
(*a*) $\frac{1+\sin\phi}{1-\sin\phi}$ (*b*) $\frac{1-\sin\phi}{1+\sin\phi}$

(c) $\frac{1-\sin\phi}{\sin\phi}$ (d) $\frac{\sin\phi}{1+\sin\phi}$
(e) none of the above.

10.210. The velocity of a mass of 5 kg after falling a height of 5 m from rest would be approximately equal to
(a) 5 m/sec (b) 10 m/sec
(c) 25 m/sec (d) 50 m/sec
(e) unpredictable.

10.211. A body whose true weight is 14 gm appeared to weigh 13 gm when weighed by means of a spring balance in a moving lift. What was the acceleration of lift at that time
(a) 1 m/sec^2 (b) 0.7 m/sec^2
(c) 0.5 m/sec^2 (d) 0.4 m/sec^2
(e) 0.35 m/sec^2.

10.212. A ball is thrown up. The sum of kinetic and potential energies will be maximum at
(a) ground
(b) highest point
(c) in the centre while going up
(d) at all the points
(e) in the centre while coming down.

10.213. The values of acceleration due to gravity at two places A and B is g_1 and g_2. The weight of body when carried from A to B will be multiplied by
(a) $\frac{g_1}{g_2}$ (b) $\frac{g_2}{g_1}$
(c) $\sqrt{\frac{g_1}{g_1}}$ (d) $\sqrt{\frac{g_2}{g_1}}$
(e) $1-\frac{g_2}{g_1}$.

10.214. Energy is defined as
(a) rate of doing work
(b) capacity of doing work
(c) power of doing work
(d) all of the above
(e) none of the above.

10.215. Moment of inertia of a body does not depend upon
(a) angular velocity of body
(b) mass of the body
(c) distribution of mass in the body
(d) axis of rotation of the body
(e) depends on all the above.

10.216. Power is defined as
(a) rate of doing work
(b) capacity of doing work
(c) power of doing work
(d) all of the above
(e) none of the above.

10.217. A jet engine works on the principle of conservation of
(a) energy (b) mass
(c) angular momentum
(d) linear momentum
(e) none of the above.

10.218. A wound watch spring possesses energy stored in the form of
(a) kinetic energy (b) potential energy
(c) mechanical potential energy
(d) mechanical kinetic energy
(e) both potential and kinetic energy.

10.219. Work is equal to
(a) force × velocity
(b) force × time (c) force × distance
(d) mass × acceleration
(e) mass × velocity

10.220. When a horse pulls a cart, he moves forward by the force
(a) exerted on him by the cart
(b) he exerts on the cart
(c) he exerts on the ground
(d) exerted on him by the ground
(e) none of the above.

10.221. A rubber ball strikes a wall and rebounds. A lead ball of the same mass and velocity strikes the same wall and falls down. Which of the following statements is correct ?
(a) both undergo an equal change in momentum
(b) the momentum of rubber ball is less than that of lead ball
(c) the change in momentum suffered by lead ball is less than that of rubber ball
(d) behaviour of lead ball and rubber ball is unpredictable
(e) none of the above.

10.222. A ball will cover maximum distance when it is kicked at a certain angle to the horizontal. This angle is
(a) 0° (b) 30°

(c) 45° (d) 90°
(e) 60°

10.223. An elastic rod, 1 m long of negligible weight hangs downward from a support. In one case a load is applied on rod, 20 cm below the support and in other case the same load is applied at bottom of rod. The reactions at supports in these two cases will be
(a) more in first case
(b) same
(c) more in second case
(d) data are not sufficient to determine the same
(e) none of the above.

10.224. The S.I. unit of pressure is
(a) newton metre square
(b) newton metre
(c) newton per metre square or pascal
(d) newton per metre
(e) newton per cm square.

10.225. One newton is equal to
(a) 10^7 dyne (b) 10^5
(c) 10^4 dyne (d) 10^3 dyne
(e) 10^2 dyne.

10.226. The angular velocity of a particle changes from 69 to 71 rpm in 30 secs. Its angular acceleration in rev/min is equal to
(a) 1 (b) 2
(c) 4 (d) 8
(e) none of the above.

10.227. If u_1 and u_2 are the velocities of approach of two moving bodies in the same direction and their corresponding velocities of separation are v_1 and v_2 then, as per Newton's law of collision of elastic bodies, the coefficient of restitution 'e' is given by

(a) $e = \frac{v_1 - v_2}{u_1 - u_2}$ (b) $e = \frac{u_2 - u_1}{v_1 - v_2}$

(c) $e = \frac{v_2 - v_1}{u_1 - u_2}$ (d) $e = \frac{v_1 - v_2}{u_2 - u_1}$

(e) none of the above.

10.228. Momentum is defined as
(a) force × distance
(b) mass × acceleration
(c) mass × time
(d) mass × velocity
(e) force × time.

10.229. Which of the following have same units
(a) momentum and impulse
(b) stress and pressure
(c) work and kinetic energy
(d) kinetic energy and potential energy
(e) all of the above.

10.230. For perfectly elastic bodies, the value of the coefficient of restitution is
(a) zero (b) 0.5
(c) 1.0 (d) between 0 and 1
(e) all of the above.

10.231. A body moves down a smooth inclined plane and if same body is dropped vertically down from the same height as of inclined plane top, then following parameters on reaching the ground will be same
(a) velocity (b) momentum
(c) kinetic energy (d) all of the above
(e) time.

10.232. Rate of change of momentum is proportional to the
(a) displacement (b) velocity
(c) acceleration (d) impressed force
(e) initial momentum.

10.233. A ball of mass 1 kg moving with a velocity of 2 m/sec collides directly on a stationary ball of mass 2 kg and comes to rest after impact. The velocity of the second ball after impact will be
(a) zero (b) 0.5 m/sec
(c) 1.0 m/sec (d) 2.0 m/sec
(e) none of the above.

10.234. The units of momentum are same as of
(a) work (b) energy
(c) force (d) impulse
(e) inertia.

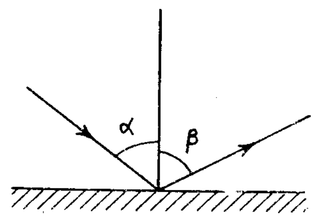

Fig. 10.31.

10.235. A ball weighing W kg strikes the ground at angle α as shown in Fig. 10.31 and is deflected at angle β. The coefficient of restitution will be

(a) $\frac{\tan\alpha}{\tan\beta}$ (b) $W\frac{\tan\beta}{\tan\alpha}$

(c) $W\frac{\tan\alpha}{\tan\beta}$ (d) $\frac{\tan\beta}{\tan\alpha}$

(e) $1 - \tan\alpha\tan\beta$.

10.236. Impulse is defined as
(a) mass × velocity
(b) force × time
(c) mass acceleration
(d) force × distance
(e) mass × time.

10.237. The masses of two balls are in the ratio of 2 : 1 and their respective velocities are in the ratio of 1 : 2 but in the opposite direction before impact. If the coefficient of restitution is $\frac{1}{2}$, the velocities of separation of the balls will be equal to
(a) original velocity in the same direction
(b) half the original velocity in the same direction
(c) half the original velocity in the opposite direction
(d) original velocity in the opposite direction
(e) none of the above.

10.238. The work done by a body in moving down a smooth inclined plane in comparison to being dropped vertically downwards from same height will be
(a) more (b) less
(c) equal (d) zero in both cases
(e) depends on slope of inclined plane.

10.239. A body of mass m moving with a constant velocity v hits another body of same mass at rest and sticks to it. The velocity of both together will be equal to
(a) v (b) zero
(c) $2v$ (d) $v/2$
(e) unpredictable.

10.240. A marble ball is rolled on a smooth floor of a room to hit a wall. If the time taken by the ball in returning to the point of projection is twice the time taken in reaching the wall, the coefficient of restitution between the ball and the wall is
(a) 0.25 (b) 0.50
(c) 0.75 (d) 1.0
(e) none of the above.

10.241. Rate of change of momentum takes place in the direction
(a) of motion
(b) of applied force
(c) opposite to the direction of applied force
(d) perpendicular to the direction of motion
(e) of an angle to applied force at resultant of applied force and inertia force.

10.242. If the momentum of a given body is doubled, its kinetic energy will
(a) increase by 2 times
(b) increase by four times
(c) remain same
(d) get halved
(e) reduce to one fourth.

10.243. If a ball which is dropped from a height of 2.25 m on a smooth floor attains the height of bounce equal to 1.00 m, the coefficient of the restitution between the ball and the floor is equal to
(a) 0.25 (b) 0.50
(c) 0.67 (d) 0.33
(e) 0.75.

10.244. A ball moving with a velocity of 5 m per sec impinges on a fixed plane at an angle of 45°, its direction after impact is equally inclined to the line of impact. If coefficient of restitution is 0.5, the velocity of the ball after impact will be
(a) 0.5 m/sec (b) 1.5 m/sec
(c) 2.5 m/sec (d) 3.5 m/sec
(e) 4.5 m/sec.

10.245. Pick up the correct statement from the following : A rubber ball when strikes a wall rebounds but a lead ball of same mass and velocity when strikes the same wall falls down
(a) both undergo an equal change in momentum
(b) the change in momentum suffered by lead ball is less than that of rubber ball

(*c*) the momentum of rubber ball is less than that of lead ball
(*d*) all of the above
(*e*) none of the above.

10.246. Two pieces of steel and brass weighing 2 kg and 1 kg fall freely under action of gravity from a tower. After a distance, the following will be identical
(*a*) acceleration (*b*) momentum
(*c*) kinetic energy (*d*) potential energy
(*e*) total energy.

10.247. If a solid and a hollow sphere of the same mass are allowed to roll down an inclined plane simultaneously, then
(*a*) solid sphere will reach the ground first
(*b*) hollow sphere will reach the ground first
(*c*) both will reach the ground at the same time
(*d*) unpredictable
(*e*) none of the above.

10.248. If a light and a heavy body have equal kinetic energy of translation, then
(*a*) lighter body will have smaller momentum
(*b*) heavy body will have smaller momentum
(*c*) both will have same momentum
(*d*) which one has greater momentum will depend on other factors
(*e*) unpredictable.

10.249. Pick up the correct statement from the following
(*a*) the kinetic energy of a body before impact is equal to the kinetic energy of the body after impact
(*b*) the kinetic energy of a body before impact is less than the kinetic energy of the body after impact
(*c*) the kinetic energy of the body before impact is more than that after impact
(*d*) the kinetic energy of the body remains constant
(*e*) none of the above.

10.250. Periodic time of a particle moving with simple harmonic motion is the time taken by the particle for
(*a*) half oscillation
(*b*) quarter oscillation
(*c*) complete oscillation
(*d*) 2 oscillation
(*e*) none of the above.

10.251. If a particle moves in a circle of radius r with a velocity v, then its acceleration towards the centre is equal to
(*a*) $v \times r$ (*b*) v/r
(*c*) $v^2 \times r$ (*d*) v^2/r
(*e*) v^2/r^2.

10.252. The value of acceleration due to gravity at poles as compared to at equator is
(*a*) greater
(*b*) lesser
(*c*) same
(*d*) may be lesser or greater depending upon latitude
(*e*) unpredictable.

10.253. Periodic time of a body moving with simple harmonic motion is
(*a*) directly proportional to its angular velocity
(*b*) directly proportional to the square of its angular velocity
(*c*) inversely proportional to the square of its angular velocity
(*d*) inversely proportional to its angular velocity
(*e*) none of the above.

10.254. If a particle moves along the circumference of a circle of radius 'r' with a uniform angular velocity ω radians/sec, the equation for the velocity of the particle is given by
(*a*) $v = \omega\sqrt{y^2 - r^2}$ (*b*) $v = \omega\sqrt{y - r}$
(*c*) $v = \omega\sqrt{r^2 - y^2}$ (*d*) $v = \omega\sqrt{r^2 + y^2}$
(*e*) none of the above.
where y is the projection of point on diameter.

10.255. Pick up an incorrect statement from the following in a simple harmonic motion
(*a*) the velocity is maximum at its mean position
(*b*) the velocity is minimum at the end of the stroke
(*c*) the acceleration is minimum at the end of the stroke
(*d*) the acceleration is zero at the mean position
(*e*) none of the above.

10.256. For a particle moving with a simple harmonic motion the frequency is
(*a*) directly proportional to periodic time
(*b*) inversely proportional to periodic time
(*c*) inversely proportional to its angular velocity
(*d*) directly proportional to its angular velocity
(*e*) none of the above.

10.257. In simple harmonic motion, acceleration of a particle is proportional to
(*a*) rate of change of velocity
(*b*) displacement
(*c*) velocity
(*d*) direction
(*e*) square of velocity.

10.258. The force which produces an acceleration of 1 m/sec^2 in a mass of 1 kg is known as
(*a*) kg (*b*) kgm
(*c*) newton (*d*) joule
(*e*) erg.

10.259. One joule is equal to
(*a*) 10^2 erg (*b*) 10^7 erg
(*c*) 10^5 erg (*d*) 10^4 erg
(*e*) 10^3 erg.

10.260. Joule is the unit of
(*a*) force (*b*) work
(*c*) power (*d*) energy
(*e*) none of the above.

10.261. A body of mass M falling freely under the action of gravity has following weight
(*a*) M (*b*) $M/2$
(*c*) $M - gM$ (*d*) $M + gM$
(*e*) zero.

10.262. Which one is a unit of time
(*a*) half year (*b*) angstrom
(*c*) light year (*d*) micron
(*e*) none of the above.

10.263. The principle of conservation of energy can't be applied in the following case
(*a*) body sliding down a rough inclined plane
(*b*) simple pendulum
(*c*) flow through a venturi tube
(*d*) a particle moving in a gravitational field
(*e*) a particle executing SHM.

10.264. A body of mass m moving with a constant velocity v hits another body of the same mass moving with the same velocity v but in opposite direction and sticks to it, then the velocity of the compound body after collision is
(*a*) zero (*b*) $v/2$
(*c*) $4v$ (*d*) $2v$
(*e*) v.

10.265. A body is thrown vertically upwards with a velocity of 980 cm/sec then the time the body will take to reach the ground will be
(*a*) 1 sec (*b*) 2 sec
(*c*) 2.5 sec (*d*) 4 sec
(*e*) 5 sec.

10.266. A body is thrown vertically upwards from the ground with a speed of 980 cm/sec. It will rise to a height of
(*a*) 980 cm (*b*) 490 cm
(*c*) 49 cm (*d*) 10 cm
(*e*) none of the above.

10.267. A body starting with initial velocity zero, moves in straight line as per law $s = 2t^3 - t^2 - 2$ (s = distance, t = time). The acceleration of particle after 1 sec will be
(*a*) 8 m/sec^2 (*b*) 9 m/sec^2
(*c*) 10 m/sec^2 (*d*) 5 m/sec^2
(*e*) 3 m/sec^2

10.268. A stone falls from the top of a building 200 m high and at the same time another is projected vertically upwards with a velocity of 50 m/sec, then the two will meet
(*a*) after 1 sec (*b*) after 2 sec
(*c*) after 4 sec (*d*) after 5 sec
(*e*) after 10 sec.

10.269. A ball is dropped vertically downward from the top of a building and another one is thrown horizontally. Which will strike ground first
(*a*) one dropped vertically
(*b*) one thrown horizontally
(*c*) both will strike simultaneously
(*d*) it will depend on their mass
(*e*) it will depend on resistance of air.

10.270. A rubber ball is dropped from a height of 2 metres. To what height will it rise if there is no loss of velocity after rebounding

(*a*) 4 metres (*b*) 3 metres
(*c*) 2 metres (*d*) 1 metre
(*e*) none of the above.

10.271. A 6 m long rope of weight 0.5 kg/m is hanging freely from a support. The work done in lifting up the rope upto the support point will be
(*a*) 6 kg m (*b*) 3 kg m
(*c*) 9 kg m (*d*) 12 kg m
(*e*) 18 kg m.

10.272. A boatman rowing his boat at normal speed takes 12 minutes to cover 2 kilometers downstream, while rowing up stream at the same speed he takes 20 minutes to cover the same distance. The normal speed of the boat is
(*a*) 2 kilometres/hour
(*b*) 4 kilometres/hour
(*c*) 6 kilometres/hour
(*d*) 8 kilometres/hour
(*e*) 10 kilometres/hour.

10.273. A car is moving with a velocity of 60 km/hr and possesses energy of 5×10^5 joules. The mass of car will be
(*a*) 3000 kg (*b*) 1800 kg
(*c*) 500 kg (*d*) 250 kg
(*e*) none of the above.

10.274. A stone is whirled in a vertical circle. The tension in the string is greatest when the stone is
(*a*) in the lowest position
(*b*) in the highest position
(*c*) in the position when the string is horizontal
(*d*) tension is equal in all positions
(*e*) in none of the above positions.

10.275. The weight of an object would be minimum when it is placed
(*a*) at north/south pole
(*b*) at hill (*c*) at equator
(*d*) at the centre of the earth
(*e*) at sea level.

10.276. A 10 cm diameter wheel is rotating at 420 rpm. Its angular speed in radians/sec is equal to
(*a*) 42 (*b*) 84
(*c*) 44 (*d*) 420
(*e*) 210.

10.277. Centripetal force is given by
(*a*) $\frac{1}{r} mv^2$ (*b*) $\frac{1}{2} m \frac{v^2}{r}$
(*c*) $\frac{mv^2}{r}$ (*d*) $\frac{mv}{r}$
(*e*) $\frac{mv^2}{r^2}$

10.278. A stone tied to the end of a 20 cm long string is whirled in a horizontal circle with a constant angular speed. If the centripetal acceleation is 980 cm per sec^2, then its angular speed will be
(*a*) 98 radians/sec (*b*) 49 radians/sec
(*c*) 14 radians/sec (*d*) 7 radians/sec
(*e*) 3.5 radians/sec.

10.279. A stone is whirled in a vertical circle, the tension in the string is greatest
(*a*) when the string is horizontal
(*b*) when the stone is at the highest position
(*c*) when the stone is at the lowest position
(*d*) at all the positions
(*e*) none of the above.

10.280. The apparent weight of a man in moving lift is less than his real weight when it is going down with
(*a*) uniform speed
(*b*) an acceleration
(*c*) some linear momentum
(*d*) retardation (*e*) none of the above.

10.281. A partially filled tank is being carried on a truck moving with constant acceleration. The water level of free surface in tank
(*a*) will remain horizontal
(*b*) fluctuate
(*c*) move up in front and down in back
(*d*) move up in back and move down in front
(*e*) move up in centre and down in front and back.

10.282. When a body falls freely under gravitational force, it possesses
(*a*) maximum weight
(*b*) minimum weight
(*c*) no weight
(*d*) no effect on its weight
(*e*) a weight depending upon the velocity.

10.283. The first law of motion provides the definition of
(*a*) momentum (*b*) force
(*c*) acceleration (*d*) energy
(*e*) none of the above.

10.284. When the spring of a watch is wound it will possess
(*a*) heat energy (*b*) kinetic energy
(*c*) potential energy
(*d*) wound energy
(*e*) both potential and kinetic energy.

10.285. A body is moving with a constant speed of 10 m/sec in a circle of radius 10 cm, then its angular acceleration will be
(*a*) zero (*b*) 0.1 radian/sec^2
(*c*) 1 radian/sec^2 (*d*) 10 radians/sec^2
(*e*) 100 radians/sec^2.

10.286. A jet engine works on the principle of
(*a*) conservation of energy
(*b*) conservation of linear momentum
(*c*) earth's gravity
(*d*) gravitational energy
(*e*) none of the above.

10.287. Which of the following remains constant during flight of a projectile
(*a*) angle of projectile
(*b*) horizontal component of velocity
(*c*) vertical component of velocity
(*d*) sum of its kinetic energy and potential energy
(*e*) momentum.

10.288. A body is thrown up at an angle of 45° with a velocity of, 100 m/sec so as to describe a parabola. Its velocity on point of return down will be
(*a*) zero (*b*) 130 m/sec
(*c*) 50 m/sec (*d*) $\frac{100}{\sqrt{2}}$ m/sec
(*e*) unpredictable.

10.289. The escape velocity in relation to orbital velocity is
(*a*) same (*b*) $\sqrt{2}$ times
(*c*) $\frac{1}{\sqrt{2}}$ times (*d*) 2 times
(*e*) $\frac{1}{2}$ time.

10.290. The velocity of a satellite in order that it remains in a particular orbit, depends upon
(*a*) mass of the satellite
(*b*) initial velocity of projection
(*c*) distance of satellite from the centre of earth
(*d*) inclination of the plane of the orbit with equatorial plane
(*e*) all of the above.

10.291. A satellite is kept on moving in its orbit around the earth due to
(*a*) centrifugal force
(*b*) centripetal force
(*c*) gravitational force
(*d*) resultant forces acting on sattelite
(*e*) some other force.

10.292. What will happen to the time period of a simple pendulum bob when it is made to oscillate in water
(*a*) time period will remain same
(*b*) time period will decrease
(*c*) time period will increase
(*d*) unpredictable
(*e*) none of the above statement is correct.

10.293. An object weights 60 gm in air, 50 gm in water and 40 gm in oil. Then the specific gravity of the oil will be
(*a*) 0.25 (*b*) 1.00
(*c*) 1.50 (*d*) 2.00
(*e*) 4.00.

10.294. A projectile fired at 45° attains a maximum height of 40 m. Its range will be
(*a*) 20 m (*b*) 40 m
(*c*) 80 m (*d*) 160 m
(*e*) 240 m.

10.295. Which of the following pairs of physical quantities have identical dimension ?
(*a*) Momentum and impulse
(*b*) Work and energy
(*c*) Torque and energy
(*d*) all of the above
(*e*) none of the above.

10.296. The order of magnitude of gravitational constant in the MKS system is
(*a*) 10^{-11} (*b*) 10^{-19}
(*c*) 10^{-13} (*d*) 10^{-24}
(*e*) 10^{-29}

10.297. The moment of inertia does not depend upon

(*a*) the angular velocity of the body
(*b*) the mass of the body
(*c*) the distribution of mass in the body
(*d*) the axis of rotation of the body
(*e*) none of the above.

10.298. A circular disc rolls down an inclined plane. The fraction of its total energy associated with its rotation is
(*a*) 1/2 (*b*) 1/3
(*c*) 1/4 (*d*) 2/3
(*e*) none of the above.

10.299. The kinetic energy of a body rotating with an angular speed ω depends on
(*a*) ω only (*b*) ω^2 only
(*c*) its mass only
(*d*) the distribution of mass and angular speed
(*e*) all of the above.

10.300. Moment of Inertia of a rectangular lamina of mass M, length l and breadth b about an axis perpendicular to its plane and passing through its centre of gravity is given by
(*a*) $M\left(\frac{l^2+b^2}{12}\right)$ (*b*) $M\left(\frac{l^3+b^3}{12}\right)$
(*c*) $M\left(\frac{l^2+b^2}{4}\right)$ (*d*) $M\left(\frac{l^2+b^2}{2}\right)$
(*e*) $M\left(\frac{l^2+b^2}{8}\right)$

10.301. The velocity of the satellite in an orbit close to earth's surface depends on
(*a*) radius of the orbit only
(*b*) acceleration due to gravity only
(*c*) product of radius and acceleration due to gravity
(*d*) product of radius and gravitational constant
(*e*) none of the above.

10.302. The force keeping the planets in a regular orbit is
(*a*) electrostatic force
(*b*) magnetic force
(*c*) gravitational force
(*d*) nuclear force
(*e*) all of the above.

10.303. A thief stole a box full of jewellery of W kg and while carrying it on his head jumped down from third storey of the building. Before he reached the ground, he experienced a load of
(*a*) zero
(*b*) infinite
(*c*) less than W
(*d*) greater that W
(*e*) $W/2$.

10.304. The escape velocity of a body on earth
(*a*) increases with the increase of its mass
(*b*) decreases with the increase of its mass
(*c*) remains unchanged with variation of mass
(*d*) varies as the square of the change in mass
(*e*) varies as the square root of change in mass.

10.305. A simple pendulum is set into oscillations. The bob of the pendulum comes to rest after some time due to
(*a*) friction of air
(*b*) its mass
(*c*) tension in the string
(*d*) gravity
(*e*) all of the above.

10.306. The amplitude of a vibrating body situated in a resisting medium
(*a*) decrease exponentially with time
(*b*) increases exponentially with time
(*c*) decreases rapidly with time
(*d*) remains constant with time
(*e*) decreases linearly with time.

10.307. A simple pendulum is vibrating in an evacuated chamber. It will
(*a*) oscillate forever with the same amplitude and frequency
(*b*) come to rest eventually
(*c*) oscillate at the same frequency and amplitude will decrease with time
(*d*) oscillate with the same amplitude and its frequency will decrease with time
(*e*) none of the above.

10.308. A swinging pendulum eventually stops because its energy is
(*a*) destroyed
(*b*) converted to kinetic energy
(*c*) converted to potential energy
(*d*) converted to heat energy
(*e*) all of the above.

10.309. The length of a second's pendulum on the surface of earth is 1 metre. The length of second's pendulum on the surface of moon, where g is 1/6th of the value of g on the surface of earth, is
(*a*) 1/6 metre (*b*) 6 metres
(*c*) 1/36 metre (*d*) 36 metres
(*e*) none of the above.

10.310. The energy of a damped oscillator
(*a*) decreases linearly with time
(*b*) increases linearly with time
(*c*) decreases exponentially with time
(*d*) increases exponentially with time
(*e*) remains constant with time.

10.311. A tunnel is dug through the earth from one end to the opposite end along a diameter and a particle is dropped at one end of the tunnel. The particle will
(*a*) come out of the other end
(*b*) execute simple harmonic motion about the centre of the earth
(*c*) immediately come to rest at the centre
(*d*) stay at the point where it is dropped
(*e*) unpredictable.

10.312. The type of motion when the acceleration is proportional to displacement is called
(*a*) translation (*b*) rotational
(*c*) gyroscopic (*d*) simple harmonic
(*e*) noner of the above.

10.313. As the acceleration of a vibrating particle executing simple harmonic motion increases, its time period
(*a*) increases (*b*) decreases
(*c*) remains unchanged
(*d*) first decreases and then increases
(*e*) first increases and then decreases.

10.314. A small metal ball is tied to a light string and is suspended inside a lift. The ball is set to oscillations. The period of oscillations is maximum when the lift is
(*a*) at rest
(*b*) moving downward at a constant speed
(*c*) moving upward at constant speed
(*d*) moving downward with acceleration
(*e*) moving upward with acceleration.

10.315. Period of simple harmonic vertical oscillation of a loaded light spring
(*a*) is independent of mass attached to the spring
(*b*) increases with increase in mass attached to the spring
(*c*) decreases with increase in the mass attached to the spring
(*d*) increases with decrease in mass attached to the spring
(*e*) none of the above.

10.316. A boy is swinging on a swing. If another boy sits along with him without disturbing his motion, then the time period of swing will
(*a*) increase
(*b*) decrease
(*c*) be doubled
(*d*) remain the same
(*e*) is halved.

10.317. If a projectile be fired at angle α with horizontal with initial velocity u, then time of flight is equal to
(*a*) $\frac{2u \sin \alpha}{g}$ (*b*) $\frac{u \sin \alpha}{g}$
(*c*) $\frac{u \sin \alpha}{2g}$ (*d*) $\frac{2u \cos \alpha}{g}$
(*e*) not possible to determine.

10.318. Horizontal range of a projectile fired with initial velocity u at angle α to horizontal is equal to
(*a*) $\frac{u^2 \sin 2\alpha}{g}$ (*b*) $\frac{u^2 \cos 2\alpha}{g}$
(*c*) $\frac{u^2 \cos \alpha}{g}$ (*d*) $\frac{u^2 \sin \alpha}{g}$
(*e*) $\frac{u^2 \sin^2 \alpha}{g}$.

10.319. The range of projectile is maximum when the angle of projection is
(*a*) 45° (*b*) 30°
(*c*) 60° (*d*) $22\frac{1}{2}°$
(*e*) none of the above.

10.320. Time of flight of a projectile fired with velocity u at angle of α with horizontal on an upward inclined plane of β with horizontal is equal to
(*a*) $2u \sin(\alpha - \beta)/g \cos \beta$
(*b*) $2u^2 \sin(\alpha - \alpha) \cos \alpha/g \cos^2 \beta$
(*c*) $2u \sin(\alpha + \beta)/g \cos \beta$

(*d*) $2u^2 \sin(\alpha + \beta) \cos \alpha / g \cos^2 \beta$
(*e*) $g \cos \beta / 2\mu \sin(\alpha + \beta)$.

10.321. The range of projectile in above case is
(*a*) $2u \sin(\alpha - \beta)/g \cos \beta$
(*b*) $2u^2 \sin(\alpha - \beta) \cos \alpha / g \cos^2 \beta$
(*c*) $2u \sin(\alpha + \beta)/g \cos \beta$
(*d*) $2u^2 \sin(\alpha + \beta) \cos \alpha / g \cos^2 \beta$
(*e*) $g \cos \beta / 2u \sin(\alpha + \beta)$.

10.322. The direction of projectile for the range to be maximum on the inclined plane of 30° to horizontal should be
(*a*) 30° with vertical
(*b*) 45° with vertical
(*c*) 60° with vertical
(*d*) 30° with inclined plane
(*e*) none of the above.

10.323. Which of the following is not a scalar quantity
(*a*) time
(*b*) money
(*c*) weight of a body
(*d*) body's mass
(*e*) amount of work.

10.324. Which of the following is an example of a body undergoing translational equilibrium
(*a*) a body at rest on a table
(*b*) a body travelling in a circular path at a constant speed
(*c*) a body rotating with a constant angular speed about an axis
(*d*) a body sliding down a frictionless inclined plane
(*e*) a rock thrown vertically upward when it is at the top its path.

10.325. The frequency of a vibrating string is
(*a*) directly proportional to square of the tension
(*b*) inversely proportional to square of the tension
(*c*) inversely proportional to the diameter of the string
(*d*) directly proportional to the square root of the mass per unit length
(*e*) inversely proportional to the square root of the mass parameter for unit length.

10.326. When two systems are in resonance, then the following parameter for both is equal
(*a*) amplitude
(*b*) wavelength
(*c*) intensity
(*d*) frequency
(*e*) all of the above.

10.327. If a system in equilibrium consists of six equal concurrent coplanar forces, each force acting in a different direction, then the angle between any pair of forces is
(*a*) 30° (*b*) 45°
(*c*) 60° (*d*) 75°
(*e*) 90°.

10.328. Choose the correct statement
(*a*) no acceleration is produced in the body when it moves with a constant speed along a circle
(*b*) no work gets done on it when it moves with a constant speed along a circle
(*c*) no force acts on the body when the body moves with a constant speed along a circle
(*d*) its velocity remains constant when the body moves with a constant speed along a circle
(*e*) none of the above.

10.329. A bucket of water weighing 10 kg is pulled up from a well 20 metre deep by a rope weighing 1 kg/m length, then the work done is
(*a*) 200 kg-m (*b*) 400 kg-m
(*c*) 500 kg-m (*d*) 600 kg-m
(*e*) none of the above.

10.330. A ship will sink if it does not displace water equal to its own
(*a*) volume (*b*) density
(*c*) surface area (*d*) weight
(*e*) all of the above.

10.331. If the momentum of a given particle is doubled then its kinetic energy will
(*a*) be halved
(*b*) be doubled
(*c*) be quadrupled
(*d*) be same
(*e*) none of the above.

10.332. The atmosphere of earth is retained due to
(*a*) gravitational pull of earth
(*b*) outer molecular attraction forces on the molecule