

Process Instrumentation and Control

- 19.1. A device for determining the value or magnitude of a quantity or variable :
 (a) sensor (b) transducer
 (c) gauge (d) instrument
 (e) indicator.
- 19.2. Determining moisture in steam by measuring the temperature in a throttling calorimeter is an example of :
 (a) direct measurement
 (b) indirect measurement
 (c) measurement by comparison
 (d) measurement by calibration
 (e) automatic measurement.
- 19.3. The closeness with which the reading of an instrument approaches the true value of the variable being measured is called :
 (a) accuracy (b) precision
 (c) sensitivity (d) resolution
 (e) discrimination.
- 19.4. Errors due to assignable causes are called :
 (a) static errors (b) systematic errors
 (c) calibration errors
 (d) random errors
 (e) known errors.
- 19.5. Pick up the appropriate word for
 A pointer moving over a scale :
 (a) instrument (b) indicator
 (c) transducer (d) gauge
 (e) recorder.
- 19.6. Pick up the appropriate word for
 A reading obtained from the motion of a pointer on a scale :
 (a) analog (b) digital
 (c) display (d) indicator
 (e) instrument.
- 19.7. Pick up the appropriate word for
 The reading displayed as a number, a series of holes on a punched card, or a sequence of pulses on magnetic tape :
 (a) pulse train (b) digital
 (c) analog (d) numeral
 (e) recording.
- 19.8. For studying detailed variations with time, one uses :
 (a) indicator (b) digital indicator
 (c) recorder (d) integrator
 (e) analog indicator.
- 19.9. The condition of how much successive readings differ from one another for a fixed value of the variable is called :
 (a) accuracy (b) error
 (c) sensitivity (d) resolution
 (e) precision.
- 19.10. The ratio of output signal or response of the instrument to a change in input or measured variable is called :
 (a) sensitivity (b) precision
 (c) resolution (d) threshold
 (e) accuracy.
- 19.11. The smallest change in measured value to which the instrument will respond is called
 (a) accuracy (b) precision
 (c) amplification (d) resolution
 (e) sensitivity.
- 19.12. It responds directly to the measured quantity, producing a related motion or signal :
 (a) sensing element
 (b) transducer

- (c) transmitter (d) indicator
(e) measuring device.
- 19.13. Which of the following is used to count the number of brass items passing on a conveyor line, when no contact is permitted with the object :
- (a) event counter
(b) mechanical counter
(c) magnetic pick up
(d) photoelectric cell
(e) electronic counter.
- 19.14. Which of the following does not pertain to timing device :
- (a) charging of a condenser
(b) flow of oil through a dash pot
(c) release of air through a nozzle
(d) flow of sand through an opening
(e) piezoelectric crystal.
- 19.15. Motion of fast-moving systems may be timed and studied by means of a :
- (a) stroboscope (b) piezoelectric crystal
(c) electronic timer
(d) chronometer
(e) photovoltaic cell.
- 19.16. In which device the input motion changes the inductive coupling between primary and secondary coils :
- (a) potentiometer (b) synchro
(c) collimator (d) protractor
(e) dial gauge.
- 19.17. Which effect is useful in measuring rapidly varying forces :
- (a) piezoelectric (b) strain gauge
(c) photovoltaic (d) pneumatic gauging
(e) change of capacitance.
- 19.18. Pressure measuring devices are not based on:
- (a) measure of an equivalent height of liquid column
(b) measure of the force exerted on a fixed area
(c) measure of some change in electrical or physical characteristics of the fluid
(d) area measurement by polar planimeter
(e) all of the above.
- 19.19. Which of the following may be measured by the deflection of an elastic element, by balancing against a known force, by the

- acceleration produced in an object of known mass :
- (a) force (b) pressure
(c) temperature (d) level
(e) displacement.
- 19.20. The sensitivity of reading of manometer can be increased by :
- (a) inclining the manometer tube
(b) using low specific gravity fluid
(c) application of optical magnification
(d) use of level sensing device
(e) all of the above.
- 19.21. Which of the following device is used as a standard for calibrating pressure gauges :
- (a) manometer (b) diaphragm
(c) bellows
(d) dead weight pressure tester
(e) piezoelectric crystal.
- 19.22. Which gauge can be used to measure pressure below $1 \mu\text{m}$:
- (a) dead weight tester
(b) pirani gauge
(c) ionization gauge
(d) McLeod gauge
(e) absolute pressure sensor.
- 19.23. Which is not correct statement about selection of tube material for a Bourdon gauge:
- (a) Have high creep strength to withstand high temperature
(b) Be stable enough to maintain its calibration indefinitely
(c) Be immune to corrosion from the fluid inside the tube, and from the atmosphere outside it
(d) Be hard enough to withstand the applied pressure without any part of it being stressed above the limit of proportionality
(e) Be easy to fabricate.
- 19.24. Hysteresis error in Bourdon tube can be minimized by :
- (a) using proper tube material
(b) using proper diameter and thickness of tube
(c) avoiding temperature cycling
(d) using it well within the designed pressure range
(e) using separating diaphragm and avoid direct ingress of hot. fluid to tube

- 19.25. Pick up false statement about pressure measurements :
- low pressure is normally measured by manometers
 - medium pressure by diaphragms or bellows
 - medium and high pressure by Bourdon gauge
 - all pressures by transducers
 - absolute pressure by piezoelectric crystal.
- 19.26. Pressure gauges are never connected directly to live steam because :
- the tubes or bellows which operate them would be overheated, causing serious error and damage
 - steam if leaks, can cause serious injuries to operators
 - entry of steam would cause static head error
 - parts of pressure gauge can't withstand temperature of steam
 - pressure gauges are not calibrated to measure steam pressure directly.
- 19.27. A siphon or loop in the connecting pipe is interposed as close as possible to the pressure gauge so that :
- steam can condense to form a seal of water to fill the tube or bellows at the pressure being measured
 - air or vapour collection is avoided
 - moisture formed in pipe can be drained
 - static head errors are eliminated
 - it acts as dampener and does not pass on pressure variations to sensor.
- 19.28. When the pressure medium to be measured is air or gas, the pipe is made to rise continuously to the gauge, so that :
- no air or vapour can collect in pipe
 - any moisture can be drained
 - moisture does not come in contact with elements of sensor/gauge
 - moisture can condense to form seal of water
 - static head error due to moisture is eliminated.
- 19.29. Ring balance gauge is used for measurement of :
- absolute pressure
 - vacuum
 - differential pressure
 - temperature
 - gauge pressure.
- 19.30. The deflection of centre of capsule (formed by circumferential welding of two diaphragms) is proportional to :
- active diameter of diaphragm (D)
 - \sqrt{D}
 - D^2
 - D^3
 - D^4
- 19.31. The development of following element has improved the reliability and the response action of low pressure gauges :
- diaphragm
 - capsule
 - bourdon
 - ring balance
 - all of the above.
- 19.32. Proving rings are used to measure :
- displacement
 - force
 - velocity
 - acceleration
 - shock.
- 19.33. Which is not correct about load cells used to measure weight/force :
- accuracy of the order of 0.01 to 1%
 - rugged and compact construction
 - no moving parts and negligible deflection under load
 - low resistance to side load and low overload withstand
 - hermetically sealed and thermal compensation.
- 19.34. Which type of device is suitable for dynamic force measurement :
- lever balance
 - spring balance
 - proving ring
 - piezo-electric transducer
 - all of the above.
- 19.35. Hysteresis errors in Bourdon tubes can be minimized by :
- selecting proper material
 - proper design and fabrication
 - using them well within the designed pressure range
 - avoiding direct entry of steam into it
 - calibrating it from time to time.
- 19.36. In case of strain gauge transducers, several strain cycles, and temperature cycles are carried out before making measurements, in order to :
- increase life
 - enable high repeatable readings

- (c) eliminate premature failures
(d) increase accuracy
(e) avoid drift.
- 19.37. Accuracy of standard pressure gauges, used for testing and calibration purposes is of the order of :
(a) $\pm 1.5\%$ (b) $\pm 1\%$
(c) $\pm 0.5\%$ (d) $\pm 0.25\%$
(e) $\pm 0.1\%$.
- 19.38. Which gauge is based on the change of heat conductivity of a gas with pressure and the change of electrical resistance of a wire with temperature :
(a) thermocouple gauge
(b) Bourdon gauge
(c) Ionization gauge
(d) vibrating disk gauge
(e) Pirani gauge.
- 19.39. Which of the following have relatively large and negative temperature coefficients of resistance :
(a) radiation pyrometers
(b) optical pyrometers
(c) thermistors
(d) platinum resistance detectors
(e) thermocouples.
- 19.40. Thermal expansion of a solid is employed in :
(a) thermocouple
(b) resistance thermometer
(c) bulb thermometer
(d) bimetal element
(e) zener diode.
- 19.41. Cold junction compensation is needed in case of measurement of temperature by :
(a) thermocouple (b) thermopile
(c) thermistor (d) zener diode
(e) resistance thermometer.
- 19.42. Which of the following consists of a very thin strip of nickel or platinum foil which responds to temperature in the same manner as the resistance thermometer :
(a) thermo pile (b) bolometer
(c) radiation pyrometer
(d) thermistor (e) optical pyrometer.
- 19.43. For measuring temperature in the range of -20 to 600°C , following liquid is used in glass thermometer :
(a) mercury (b) alcohol

- (c) toluene (d) pentane
(e) creosote.
- 19.44. For measuring temperature in the range of -200 to 30°C , following liquid is used in glass thermometer :
(a) mercury (b) alcohol
(c) toluene (d) pentane
(e) creosote.
- 19.45. Which of the following glass is used for 500 - 600°C temperature measurement by mercury-in-glass thermometer :
(a) lead glass (b) normal grade
(c) borosilicate (d) supermax
(e) any one of the above.
- 19.46. Pick up false statement about liquid-in-metal thermometers :
(a) remote indication of temperature can't be given
(b) error is produced if capillary passes through hot zone
(c) error also occurs if instrument base is at high ambient temperature
(d) error can also creep in by the head of the liquid if the bulb is installed either above or below the Bourdon
(e) these are used for industrial applications where accuracy is not so important.
- 19.47. Twisting the thermocouple wires together and heat welding them :
(a) is the standard practice of making junction
(b) would result in noise generation
(c) cause small errors due to local e.m.f. which may arise if the junction is too long
(d) would slow down the response
(e) result in inaccuracies.
- 19.48. Which of the following thermocouple generates highest e.m.f. for a given temperature :
(a) copper-constantan
(b) iron-constantan
(c) chromel-alumel
(d) platinum-rhodium platinum
(e) silver-palladium.
- 19.49. Protective coating by a suitable cover are applied over strain gauge in order to protect it against :

- (a) temperature rise
 (b) dust and dirt
 (c) moisture (d) ageing
 (e) shorting by conductive contact.
- 19.50. The resistance of strain gauge grid used in pressure transducers is of the order of :
 (a) 0.1 to 1 ohm
 (b) 1 to 10 ohm
 (c) 10 to 100 ohm
 (d) 100 to 2000 ohm
 (e) 2000 to 10^5 ohm
- 19.51. During temperature changing conditions, quite appreciable difference, occurs between the true-temperature and the measured temperature because of the time required for the transfer of heat through thermometer pockets (thermowells) to thermometer sensing element. This time lag is of the order of :
 (a) 0.1 to 1 sec (b) 1 to 2.5 sec
 (c) 2.5 to 10 or 20 sec
 (d) 25 to 100 sec
 (e) 100 to 500 sec.
- 19.52. Pick up false statement :
 (a) copper-constantan thermocouple is a stable couple resistant to both oxidising and reducing atmosphere, but needs protection from acidic vapours
 (b) Iron-constantan thermocouple suffers from oxidation attack on iron wire, if exposed
 (c) iron-constantan couple can be made stable by using enamelled iron
 (d) Both wires of chromel-alumel thermocouples are prone to damage by sulphurous gases
 (e) copper-constantan thermocouple is used as a reference standard for calibration purposes.
- 19.53. Automatic cold junction compensation in thermocouple is provided by :
 (a) connecting thermocouple wires, in opposition
 (b) a nickel wire resistance in series with a manganin resistance
 (c) maintaining cold junction temperature constant by a cooling unit
 (d) using a photovoltaic cell
 (e) connecting a dry battery cell in opposition.
- 19.54. The material used for resistance temperature sensor is :
 (a) copper (b) nickel
 (c) platinum (d) any one of above
 (e) none of above.
- 19.55. To prevent self-heating errors becoming too great, the current through platinum element (100 ohm) is kept at a very small value :
 (a) 0.1 mA (b) 1 mA
 (c) 5 mA (d) 20 mA
 (e) 50 mA.
- 19.56. In calibration of temperature sensors by fixed point method, the device is calibrated at :
 (a) ice point (0°C)
 (b) steam point (100°C)
 (c) sulphur point (444.6°C)
 (d) all of the above
 (e) none of the above.
- 19.57. Pick up correct statement about calibration of temperature sensors by comparison method using liquid bath :
 (a) water is used for temperatures from 0 to 100°C
 (b) special grade of paraffin oil is used for temperatures between 100 and 200°C
 (c) For temperature between 200 and 600°C , a mixture of sodium nitrate and potassium nitrate is used
 (d) all of above are true
 (e) none of above is true.
- 19.58. Local velocity is measured by a :
 (a) pitot tube (b) venturi tube
 (c) orifice plate
 (d) vena contracta device
 (e) nozzle.
- 19.59. Flange taps in case of orifice plate are installed :
 (a) 25 mm from each side of the orifice plate
 (b) D (pipe diameter) upstream and D/2 downstream
 (c) just at surface of orifice plate
 (d) 2.5 D upstream and 8 D downstream
 (e) any one of the above.
- 19.60. Vena-contracta taps are employed :
 (a) D upstream and D downstream from the plate

- (b) D upstream and at vena contracta
 (c) 2 D upstream and at vena contracta
 (d) just at surface of plate upstream and at vena contracta
 (e) any one of the above.
- 19.61. For an orifice plate having ratio of inside and pipe diameter as 0.5, the pressure loss in comparison to differential pressure created is of the order of :
 (a) 5% (b) 10%
 (c) 20% (d) 35%
 (e) 50%.
- 19.62. 15° taper venturi tube causes loss of following % of the differential pressure :
 (a) 5% (b) 10%
 (c) 20% (d) 30%
 (e) 40%.
- 19.63. Pick out false statement about advantages of orifice plates, used for flow measurement :
 (a) no moving parts
 (b) long-term reliability
 (c) high turn-down ratio
 (d) inexpensive
 (e) inherently simple in operation.
- 19.64. Pick out false statement about disadvantages of orifice plates :
 (a) square root relationship
 (b) poor turn-down ratio
 (c) critical installation requirements
 (d) short-term reliability
 (e) high irrecoverable pressure loss.
- 19.65. Dall tube is another variation of :
 (a) orifice plate (b) nozzle
 (c) venturi tube (d) rotameter
 (e) pitot-tube.
- 19.66. Target meter is concerned with measurement of :
 (a) flow (b) pressure
 (c) viscosity (d) density
 (e) level.
- 19.67. The flow error in case of normal nozzles is of the order of :
 (a) 0.1% (b) 0.2%
 (c) 0.5% (d) 1%
 (e) 2%.
- 19.68. Which of the following flow meter maintains a constant pressure differential but varies the orifice area with flow :

- (a) Ledoux bell (b) variable area
 (c) straightening vane
 (d) variable head
 (e) vane-type.
- 19.69. Flow in open channels is measured by using :
 (a) nozzle (b) orifice plate
 (c) propeller (d) weir
 (e) vortex-shedding meter.
- 19.70. For measuring air flow, following meter is often used :
 (a) vane-type or anemometer
 (b) electro magnetic flow meter
 (c) vortex-shedding meter
 (d) ultrasonic flow meter
 (e) pitot tube.
- 19.71. Laser droplet anemometer is used to measure :
 (a) pressure (b) velocity
 (c) level (d) density
 (e) temperature.
- 19.72. In which flow device the pressure loss is minimum :
 (a) orifice plate (b) nozzle
 (c) variable orifice meter
 (d) venturi tube
 (e) Dall tube.
- 19.73. Pick out the odd flow measuring device among the following :
 (a) positive displacement type
 (b) nutating disc type
 (c) sliding vane type
 (d) turbine type
 (e) hydraulic flume.
- 19.74. Dynamometers are :
 (a) force measuring devices
 (b) torque measuring devices
 (c) power measuring devices
 (d) energy measuring devices
 (e) displacement measuring devices.
- 19.75. In some measurements, in order to increase the sensitivity, two measuring and two reference cells are often used. This arrangement is usually referred to as :
 (a) wheatstone bridge
 (b) katharometer
 (c) attenuator (d) amplifier
 (e) Kelvin bridge.

- 19.76. Paramagnetic analyser is used to measure following gas sample in air
 (a) oxygen (b) ozone
 (c) nitrogen (d) nitrogen oxides
 (e) hydrocarbons.
- 19.77. Continuous analysers for measuring following are based on the chemiluminescent flameless reaction with ethylene :
 (a) oxygen (b) ozone
 (c) sulphur oxides
 (d) nitrogen oxides
 (e) pollutants.
- 19.78. In capillary viscometer, viscosity is proportional to :
 (a) flow (b) $1/\text{flow}$
 (c) $\sqrt{\text{flow}}$ (d) $1/\sqrt{\text{flow}}$
 (e) $1/\text{flow}^{3/2}$.
- 19.79. Industrial flow meters are based on :
 (a) rotational devices
 (b) flow through restrictions
 (c) flow around obstructions
 (d) all of above
 (e) none of above.
- 19.80. Chromatographic analyser is used to measure the :
 (a) O₂ content in flue gases
 (b) CO₂ content in flue gases
 (c) CO content in flue gases
 (d) amount of individual gases in a mixture
 (e) amount of elements in an alloy.
- 19.81. The Ringelmann chart is associated with measurement of :
 (a) smoke density (b) SO₂ and SO₃
 (c) NO_x (d) CO
 (e) dust concentration.
- 19.82. The pH value is a measure of hydrogen ion in a solution. The letters pH stand for :
 (a) percentage of H₂ in solution
 (b) power of the hydrogen ion concentration
 (c) presence of hydrogen ions
 (d) purity of H₂O
 (e) none of the above.
- 19.83. The density can be measured using :
 (a) weight (b) buoyancy
 (c) hydrostatic head
 (d) resonant elements
 (e) all of above.
- 19.84. Electrode potential is concerned with measurement of :
 (a) density (b) viscosity
 (c) chemical analysis
 (d) pH
 (e) all of above.
- 19.85. Almost all pH measurements are best made with a :
 (a) glass electrode
 (b) solid state electrode
 (c) liquid ion exchange electrode
 (d) redox electrode
 (e) heterogeneous membrane electrode.
- 19.86. Pure water has pH value of 7. This means that pure water has :
 (a) 7 g of ionized hydrogen per litre
 (b) 10⁷ g of ionized hydrogen in/m³
 (c) 10⁻⁷ % of ionized hydrogen
 (d) 10⁻⁷ g of ionized hydrogen per litre
 (e) none of the above.
- 19.87. Which measurement is a good guide to the quality of the water :
 (a) conductivity (b) pH
 (c) dissolved O₂ content
 (d) turbidity
 (e) all of the above.
- 19.88. The commonly used unit of conductivity is:
 (a) mho (b) mho/m
 (c) μ mho/cm (d) ohm/m
 (e) m mho/mm.
- 19.89. Spectrophotometer is used to :
 (a) measure surface hardness
 (b) measure surface characteristics
 (c) measure chemical composition of alloys
 (d) analyse colour spectrum
 (e) analyse gas composition.
- 19.90. The change in length of humidity sensitive elements is measured by :
 (a) hydrometer (b) hygrometer
 (c) psychrometer (d) photometer
 (e) all of the above.
- 19.91. The orsat apparatus is used for measuring:
 (a) chemical analysis of flue gases
 (b) moisture in air
 (c) composition of alloys
 (d) colour spectrum
 (e) molecular configuration.

- 19.92.** The error caused in vibration measuring equipment due to non compliance (not stiff) of bond made between sensor and the surface it is mounted is called :
- cross-coupling
 - coupling compliance
 - influence error
 - subject loading by sensor
 - spurious variation in capacitance.
- 19.93.** Machine health monitoring is mainly based on measurement of :
- lub oil pressure
 - vibrations at strategic points
 - bearing temperature measurement
 - efficiency and losses of machine
 - all of above.
- 19.94.** Mass-spring seismic sensors measure directly the :
- displacement
 - velocity
 - acceleration
 - shock
 - force.
- 19.95.** An operation which, in the presence of a disturbing influence, tends to reduce the difference between the actual state of a system and an arbitrarily varied desired state and which does so on the basis of this difference, is called :
- automatic control
 - feedback control
 - open feed back control
 - closed feed back control
 - self regulation.
- 19.96.** An apparatus which measures the value of a quantity or condition which is subject to change with time, and operates to maintain within limits this measured value, is called :
- automatic regulator
 - self controller
 - feedback controller
 - two-position controller
 - floating regulator.
- 19.97.** The time required for the controlled variable to reach a specified value after the application of a step input is called :
- rise time
 - settling time
 - response time
 - peak time
 - proportional time.
- 19.98.** The operating characteristic which inherently assists the establishment of equilibrium is called :
- corrective action
 - self regulation
 - automatic regulation
 - proportional control action
 - floating controller action.
- 19.99.** The quantity or condition of the controlled system which is directly, measured or controlled :
- set point
 - deviation
 - controlled variable
 - command signal
 - control agent.
- 19.100.** The range of values through which the variable must change to cause the final control element to move from one extreme position to the other :
- throttling range
 - disturbance
 - proportional band
 - response
 - deviation.
- 19.101.** The range of scale values through which the controlled variable must pass in order that the final control element be moved through its entire range :
- throttling
 - floating band
 - controller band
 - settling time
 - proportional band.
- 19.102.** A controller action in which there is a predetermined relation between the values of the controlled variable and the rate of motion of a final control element :
- floating controller action
 - proportional-position controller action
 - proportional-speed floating controller action
 - two-position controller action
 - self-regulation controller action.
- 19.103.** The controller action in which there is continuous linear relation between the position of the final control element and the value of the controlled variable :
- floating controller action
 - proportional-position controller action
 - proportional-speed floating controller action

- (d) two-position controller action
(e) self-regulation controller action.
- 19.104. The stability, accuracy, and speed of response of a control system are determined by analysing :
- its mathematical model
 - closed-loop feedback control system
 - steady-state response
 - transient response
 - steady-state and transient response.
- 19.105. The steady-state performance is evaluated in terms of the :
- accuracy with which the output is controlled for a specified input
 - maximum overshoot
 - rise time
 - response time
 - all of the above.
- 19.106. The transient performance, *i.e.* the behaviour of the output variable as the system changes, from one steady-state condition to another, is evaluated in terms of :
- accuracy
 - settling time
 - response time
 - peak time
 - maximum overshoot, rise time, and response time.
- 19.107. The immediately apparent feature of an observed transient performance is :
- the existence and magnitude of the maximum overshoot
 - the frequency of the transient oscillation
 - the response time
 - all of the above
 - none of the above.
- 19.108. Following is the property of the system which opposes a change in the output variable :
- load
 - power element
 - resistance
 - damping
 - all of the above.
- 19.109. When an automatic control system is ..., the output variable overshoots its desired steady-state condition and a transient oscillation occurs :
- underdamped
 - over damped
 - critically damped
 - damped
 - without damping.
- 19.110. The overshoot and the settling time are maximum with :
- underdamped system
 - overdamped system
 - critically damped system
 - damped system
 - non damped system.
- 19.111. Fig. 19.1 shows the system response to a unit step function command.

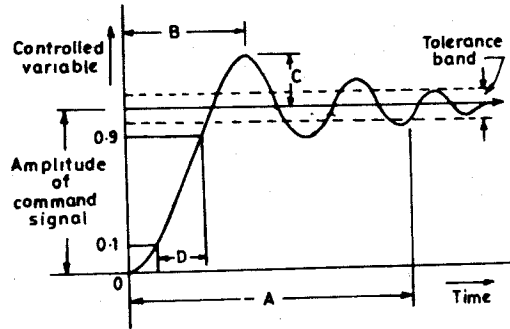


Fig. 19.1

The parameter A represents :

- rise time
 - settling time
 - maximum overshoot
 - peak time
 - none of the above.
- 19.112. In Fig. 19.1, the parameter B represents :
- rise time
 - settling time
 - maximum overshoot
 - peak time
 - none of the above.
- 19.113. In Fig. 19.1, the parameter C represents :
- rise time
 - settling time
 - maximum overshoot
 - peak time
 - none of the above.
- 19.114. In Fig. 19.1, the parameter D represents :
- rise time
 - settling time
 - maximum overshoot
 - peak time
 - none of the above.
- 19.115. The steady state output of the system to input sinusoids of varying frequency is referred to as :
- frequency response of a system
 - Nyquist plot

- (c) Bode plot
 - (d) transient response
 - (e) logarithmic plot.
- 19.116. System function is expressed as :
- (a) Response function
 - (b) Excitation function
 - (c) $(a)/(b)$ (d) $(b)/(a)$
 - (e) characteristic equation.
- 19.117. The frequency response can be obtained analytically from the :
- (a) characteristic equation
 - (b) transfer functions of the components
 - (c) polar plot (d) Bode diagram
 - (e) all of the above.

- 19.118. The transient performance characteristics of the control are conveniently obtained from curve of the :
- (a) open-loop frequency response function
 - (b) transfer functions of system
 - (c) closed loop frequency response
 - (d) all of above
 - (e) none of above.
- 19.119. The % age of silica in water is measured by a :
- (a) colorimeter (b) photometer
 - (c) electro chemical equipment
 - (d) conductivity cell
 - (e) Katharometer.

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- The ratio of specific heats C_p/C_v
 - varies linearly with temperature
 - varies linearly with pressure
 - first increases and then decreases with increase in temperature
 - first increases and then decreases with increase in pressure
 - remains constant.
- According to St. Venant's Principle
 - deformations of all materials for a given loading are equal
 - it is a method for determining the stress conditions at the end of the plates
 - stress conditions approach uniformly as the distance from the point of application of the force increases
 - after a point of time the stresses in a loaded member tend to relieve themselves
 - stress conditions vary widely in unpredictable way as the distance from the point of application of force increases.
- The maximum height of a syphon for a fluid of specific gravity ρ under atmospheric conditions is
 - $\rho/10$ metres
 - $\frac{10(1+\rho)}{\rho}$ metres
 - $10/(1-\rho)$ metres
 - $10/\rho$ metres
 - $10/(1+\rho)$ metres.
- An impulse is defined as
 - force \times displacement
 - force \times velocity
 - mass \times velocity
 - force \times time
 - torque \times time.
- Which rays have the least wavelength
 - infra-red
 - ultraviolet
 - X-rays
 - cosmic rays
 - radio waves.
- Steel reinforcing bars are used in reinforced cement concrete because
 - the concrete is weak in compression
 - it increases the density of the concrete
 - it increases life of concrete
 - it facilitates in quick setting of R.C.C.
 - the concrete is weak in tension.
- The process in which the molecules of a compound become large is known as
 - coalescence
 - polymerisation
 - charging
 - atomisation
 - expansion.
- In a 8×37 wire rope, the number 8 indicates the
 - diameter of the wire rope in mm
 - number of strands
 - number of wires
 - gauge number of the wire
 - diameter of strand.
- The compressibility of a substance is proportional to
 - the Poisson's ratio
 - the modulus of elasticity
 - the reciprocal of the modulus of elasticity
 - the bulk modulus of elasticity
 - the reciprocal of the bulk modulus of elasticity.
- A body which absorbs all readiation falling on it is known as
 - opaque body
 - black body
 - transparent body
 - ideal body
 - polished body.
- A cylindrical section having no joint is known as
 - perfect section

- (b) jointless section
(c) ERW section (d) seamless section
(e) continuous section.
12. If two objects are weighed in water and both of them lose the same weight, then the two objects must have identical
(a) specific gravities
(b) weights in air
(c) volumes
(d) densities
(e) weights in water.
13. The purpose of providing sleeves around anchor bolts that bolt steel columns to footings is to
(a) allow for minor lateral adjustments of anchor bolts
(b) provide better bearing of base plate on the footing
(c) provide greater bond between anchor bolt and footing
(d) allow the proper setting of the column
(e) provide reinforcement.
14. In order to provide arrangement for pulling etc. the ends of two rods are threaded with right handed thread and left handed thread. Both the rods are coupled together by
(a) turnbuckle (b) thimble
(c) wing nut (d) eyebolt
(e) knuckle joint.
15. A 1000 kg block resting on a horizontal plane has a static coefficient of friction of 0.33 and is acted on by a horizontal force of 200 kg. Under the above conditions, the frictional resistance is
(a) 200 kg (b) more than 200 kg
(c) 500 kg (d) less than 200 kg
(e) 1000 kg.
16. The basic purpose of using a flywheel on rotating machinery is to
(a) allow rapid acceleration
(b) store and release energy as required
(c) match output and input
(d) balance the rotating parts
(e) control the rotational speed.
17. Steel columns are tied to concrete foundations by
(a) grout (b) anchor bolts
(c) cement paste (d) bolts
(e) eyebolt.
18. In a loaded horizontal, homogeneous rectangular beam, the horizontal shearing stress at any cross-section perpendicular to the neutral axis has a maximum value at the neutral axis and in comparison to average shearing stress at that section it is
(a) 1.5 times (b) double
(c) 2.5 times (d) thrice
(e) four times.
19. Two bodies of identical shape but different densities are dropped from a tower. Which of the following is true ?
(a) as per Stoke's law they will achieve the same terminal velocity and reach the ground at the same time
(b) the less dense one will arrive first
(c) the more dense one will arrive first
(d) they will become attracted to each other and arrive at the same time
(e) which one arrives first would depend on atmospheric conditions.
20. If speed of a centrifugal pump is doubled, then
(a) power required to operate it is doubled
(b) the volumetric discharge is increased 4 times
(c) the head becomes 4 times as great
(d) specific speed becomes 4 times
(e) all of the above.
21. In a laminated spring, the various strips are made of different length for the following reason
(a) reduction in weight
(b) ease in fabrication
(c) material economy
(d) space consideration
(e) equal distribution of stress.
22. Which of the following metals has the greatest specific gravity
(a) zinc (b) lead
(c) iron (d) mercury
(e) nickel.
23. Material with maximum density is
(a) lead (b) osmium
(c) uranium (d) tungsten
(e) titanium.
24. Toughness of a material can be measured with the help of
(a) Vickers pyramid hardness test

- (b) universal testing machine
(c) notched-bar tests
(d) standard spiral tests
(e) scratch test.
25. Notched-bar tests are frequently used for testing
(a) the impact strength of a material
(b) the hardness of a material
(c) the machinability of a metal
(d) the corrosion resistance of the material
(e) the endurance limit of the material.
26. Lack of toughness in material is usually referred to as
(a) ductility (b) brittleness
(c) malleability (d) plasticity
(e) hardness.
27. The diameter of a shaft in any power transmission system is proportional to
(a) speed of the shaft
(b) torque to be transmitted
(c) horse power to be transmitted
(d) allowable shear stress of the shaft material
(e) polar moment of inertia.
28. In riveted structural steel work, the type of member that usually connects a beam to column is
(a) an angle (b) a channel
(c) a gusset plate (d) a tee
(e) a knuckle.
29. Unwin's Rule for riveted joints gives the relationship between
(a) diameter of the rivet and the load
(b) thickness of the plate and the load
(c) thickness of plate and number of rivets
(d) diameter of rivet and thickness of plate
(e) number of rivets and size of rivet.
30. The Rockwell number refers to a material's
(a) malleability (b) toughness
(c) piezo-electric constant
(d) plasticity
(e) hardness.
31. The property of steel that makes it suitable for use in cable is its strength in
(a) compression (b) tension
(c) shear (d) torsion
(e) bending.
32. The maximum efficiency of a screw jack depends upon
(a) helix angle
(b) angle of friction
(c) pitch of threads
(d) velocity ratio
(e) mechanical advantage.
33. A ball is moving in a straight path down an inclined plane with constantly increasing speed. Pick up the incorrect statement
(a) its acceleration is increasing
(b) its acceleration is constant
(c) its kinetic energy is increasing
(d) its potential energy is decreasing
(e) sum of potential and kinetic energies is constant.
34. The frequency (f) of a vibrating string is related to the mass/unit length of the string (m). Which of the following relationship is correct?
(a) f is proportional to m
(b) f is proportional to $1/m$
(c) f is proportional to \sqrt{m}
(d) f is proportional to $1/\sqrt{m}$
(e) f is proportional to $1/m^{3/2}$.
35. Design of long columns is done by the Euler's equation $\frac{P}{A} = \frac{\pi^2 R}{(L/k)^2}$. The term L/k is referred to as
(a) the stiffness ratio
(b) the rigidity factor
(c) the slenderness ratio
(d) Poisson's ratio
(e) equivalent length.
36. If ρ is the density of fluid then the hammer blow is proportional to
(a) ρ (b) ρ^2
(c) $\sqrt{\rho}$ (d) $\frac{1}{\rho}$
(e) $\frac{1}{\sqrt{\rho}}$.
37. In Diesel cycle
(a) compression ratio and expansion ratio are the same
(b) compression ratio is less than the expansion ratio
(c) compression ratio is greater than the expansion ratio
(d) compression ratio + expansion ratio = 1
(e) compression ratio - expansion ratio = 1.

38. In Diesel engines, injection of fuel continues till
 (a) the spark plug gives out a spark
 (b) the compression is complete
 (c) the clearance volume is filled with the fuel oil
 (d) the cut off point is reached
 (e) discharge valve opens.
39. The heat is supplied partly under constant pressure and partly under constant volume in the following cycle
 (a) Carnot cycle (b) Diesel cycle
 (c) Dual cycle (d) Otto cycle
 (e) Rankine cycle.
40. A critical depth meter is associated with
 (a) water hammer
 (b) tranquil flow
 (c) surge
 (d) hydraulic jump
 (e) steep gradient.
41. In multi-cylinder engines a particular sequence in the firing order is necessary
 (a) to give good distribution of fuel to all the cylinders
 (b) to give better balance of the engine
 (c) to provide the best engine performance
 (d) to operate the ignition system smoothly
 (e) to obtain uniform torque diagram.
42. As the number of cylinders in multi-cylinder engines increases, the power-to-weight ratio
 (a) remains the same
 (b) decreases
 (c) increases
 (d) becomes zero
 (e) first decreases and then increases.
43. Piston is connected to the connecting rod by
 (a) sleeve bearing
 (b) cap bolts
 (c) small end bearings
 (d) big end bearings
 (e) gudgeon pins.
44. Engine misfiring is likely to result from
 (a) spark plug gap too narrow
 (b) spark plug gap too wide
 (c) incorrect mixture
 (d) vapour lock in fuel line
 (e) spark plug running too hot or too cold.
45. Rotameter is used for measuring
 (a) density (b) viscosity
 (c) flow (d) velocity
 (e) pressure.
46. Bar is the unit of
 (a) pressure (b) power
 (c) energy (d) viscosity
 (e) level.
47. With continuous usage of the spark plug, the spark plug gap size
 (a) decreases
 (b) increases
 (c) remains the same
 (d) becomes zero
 (e) increases/decreases depending on engine rating.
48. The control rods in nuclear power plants are made of
 (a) lead (b) magnesium
 (c) graphite (d) boron or cadmium
 (e) deuterium.
49. In thermodynamics, Carnot cycle is also called as
 (a) constant pressure cycle
 (b) constant volume cycle
 (c) constant temperature cycle
 (d) constant heat cycle
 (e) constant entropy cycle.
50. Otto cycle used in petrol engines is also known as
 (a) constant pressure cycle
 (b) constant volume cycle
 (c) dual cycle (d) diesel cycle
 (e) constant heat cycle.
51. The air standard efficiency of an I.C. Engine working on the Otto cycle is a function of
 (a) working substance
 (b) volume of cylinder
 (c) compression ratio
 (d) the quality of fuel used in the engine
 (e) ratio of maximum and minimum temperature.
52. Pick up the correct statement in respect of an ideal Diesel cycle
 (a) heat is added to the working medium at constant pressure
 (b) heat is rejected from the working medium at constant pressure
 (c) both heat addition and heat rejection occur at constant volume

- (e) both heat addition and heat rejection occur at constant pressure.
53. Pick up the incorrect statement for centrifugal pumps
- Discharge \propto speed
 - Head \propto (speed)²
 - Power \propto (speed)³
 - Head \propto (diameter)²
 - Discharge \propto diameter.
54. It is preferable to mount the engine on the frame at
- one or two points
 - three points
 - four points
 - six points
 - as many points as possible.
55. Tractive effort in a passenger car is maximum in
- first gear
 - second gear
 - third gear
 - top gear
 - neutral gear.
56. Tilting of the front wheels of an automobile away from the vertical is called
- caster
 - camber
 - toe-in
 - toe-out
 - king-pin inclination.
57. Thermal efficiency of an air standard Otto cycle for a compression ratio of 5.5 will be
- 25%
 - 30%
 - 50%
 - 60%
 - 75%.
58. The most usual cause of excessive tyre wear is
- less air pressure inside the tyre
 - excessive air pressure inside the tyre
 - excessive speed of vehicle
 - improper braking system used
 - rough roads.
59. The brake efficiency is 100 per cent when
- the brakes are in excellent condition
 - the driver brings the vehicle to a dead stop in 1 second
 - the stopping distance is 10 metres at a speed of 10 km/hr
 - the rate of deceleration is 1 m/sec²
 - the rate of deceleration is 10 m/sec².
60. Sodium in fuel oil for gas turbines is harmful. It is removed before firing fuel by
- using additives
 - washing oil with water and removing water by centrifuging
 - heating oil and cooling it suddenly
 - electrostatic precipitation
 - allowing oil to settle for long time.
61. In the expression $P_1 V_1^n = P_2 V_2^n$ for an isentropic expansion, 'n' is :
- $(C_p - C_v)/C_p$
 - $(C_v - C_p)/C_v$
 - $C_v - C_p$
 - C_p/C_v
 - $1 - C_p/C_v$.
62. In which process the solid changes directly to the gaseous form
- sublimation
 - polytropic change
 - allotropic change
 - recrystallization
 - evaporation.
63. Air fuel ratio in petrol engine is controlled by
- fuel pump
 - injector
 - governor
 - carburettor
 - controller.
64. The ratio of C_p/C_v for air and most common gases below 500°C is of the order of
- 0.87
 - 1.04
 - 1.00
 - 1.27
 - 1.40.
65. A hot body will radiate heat most rapidly if its surface is
- rough and white
 - white and polished
 - grey
 - black and rough
 - black and polished.
66. The most efficient thermodynamic cycle is
- Carnot
 - Stirling
 - Diesel
 - Otto
 - Rankine.
67. In rainy season, desert coolers become ineffective because of
- fine weather
 - low temperature
 - low humidity
 - high humidity
 - none of the above.
68. Greater flexibility in plant layout is achieved in the case of
- layout by fixed position
 - process layout
 - product layout
 - group layout
 - functional layout.
69. The concept of 'ABC' analysis is applied mostly in

- (a) plant layout and materials handling
(b) ergonomics
(c) methods time measurement
(d) inventory control
(e) process planning.
70. The scientific study of the relationship between man and his working environment is known as :
- (a) industrial psychology
(b) ergonomics
(c) industrial engineering
(d) work study
(e) industrial management.
71. In theory of metal cutting the shear plane angle is the angle between
- (a) shear plane and job surface
(b) shear plane and vertical plane
(c) shear plane and horizontal plane
(d) shear plane and tool surface
(e) shear plane and tool axis.
72. The tool signature comprises
- (a) 5 elements (b) 6 elements
(c) 7 elements (d) 8 elements
(e) 9 elements.
73. In tool signature, the nose radius is indicated
- (a) in the first position
(b) in the last position
(c) in the middle (d) second from end
(e) second position.
74. Which one of the following is not a part of micrometer
- (a) thimble (b) spindle
(c) sleeve (d) beam
(e) anvil.
75. Point angle of drills is usually more while drilling
- (a) mild steel (b) aluminium
(c) soft cast iron (d) marble
(e) hard alloys.

Model Test Paper-2

Answer all the questions. Time for each question is 20 sec.

1. Mohs scale of hardness is an arbitrary one which is used to describe the hardness of several mineral substances on a scale of
 - (a) 1 through 5
 - (b) 1 through 10
 - (c) 1 through 25
 - (d) 1 through 50
 - (e) 1 through 100.
2. The specific gravity of liquids is usually measured by means of a
 - (a) hygrometer
 - (b) thermometer
 - (c) hydrometer
 - (d) piezometer
 - (e) Baume meter.
3. One of the arbitrary scale used for scale reading of a hydrometer is API (American Petroleum Institute). Corresponding to 10 A.P.I. degree, specific gravity is 1.000. As the API degrees increase beyond 10 the specific gravity value
 - (a) increases
 - (b) decreases
 - (c) remains same
 - (d) first increases and then decreases
 - (e) first decreases and then increases.
4. A structure is said to be statically indeterminate when
 - (a) it is not properly loaded
 - (b) it is imbalanced
 - (c) forces are so huge that it may collapse
 - (d) it is not properly supported
 - (e) the conditions are not sufficient for the determination of the supports or other forces.
5. If I_x and I_y be the moments of inertias about any two axes at right angles to each other in the plane of the area and intersecting at the pole, then polar moment of inertia I_p is equal to
 - (a) $I_x + I_y$
 - (b) $\frac{I_x + I_y}{2}$
 - (c) $I_x \times I_y$
 - (d) $\sqrt{I_x \times I_y}$
 - (e) $\int I_x I_y$
6. In every plane area, a given point being taken as the origin, there is at least one pair of rectangular axes in the plane of the area about one of which the moment of inertia is a maximum, and a minimum about the other. These moments of inertia are called the
 - (a) principal moments of inertia
 - (b) moments of inertia about parallel axes
 - (c) polar moment of inertia
 - (d) product of inertia
 - (e) none of the above.
7. The moment of inertia about axis YY of a rod of mass M , and length l , with shape and size of the cross section unknown (assuming approximately that the weight is all concentrated along the axis of the rod), placed horizontally is equal to
 - (a) Ml^2
 - (b) $\frac{Ml^2}{2}$
 - (c) $\frac{Ml^2}{3}$
 - (d) $\frac{Ml}{4}$
 - (e) $\frac{Ml^2}{6}$
8. If r_1 and r_2 be outer and inner radii of a thick hollow sphere and ρ its density, then its M.I. about a diameter is equal to
 - (a) $\rho\pi(r_1^5 - r_2^5)$
 - (b) $\frac{\rho\pi}{2}(r_1^5 - r_2^5)$
 - (c) $\frac{2}{3}\rho\pi(r_1^5 - r_2^5)$
 - (d) $\frac{2}{5}\rho\pi(r_1^5 - r_2^5)$
 - (e) $\frac{8}{15}\rho\pi(r_1^5 - r_2^5)$.

9. The centre of percussion of the homogeneous rod of length l and mass m , suspended vertically from top, will be at following distance from the top
- (a) $l/2$ (b) $l/3$
 (c) $2l/3$ (d) $3l/4$
 (e) $5l/8$.
10. The centre of percussion of a solid cylinder of radius ' r ' resting on a horizontal plane, (Refer Fig. 1) will be at following height above the plane

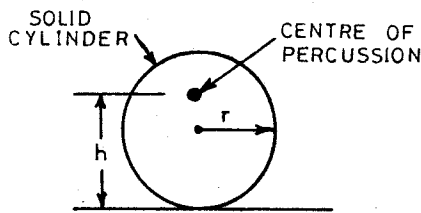


Fig. 1

- (a) $\frac{r}{2}$ (b) $\frac{2}{3}r$
 (c) $\frac{3r}{2}$ (d) $\frac{4}{3}r$
 (e) $\frac{8}{5}r$.
11. Centre of percussion and axis of oscillation
- (a) coincide
 (b) are interchangeable
 (c) act at the centre of gravity of body
 (d) are radius of gyration apart
 (e) are non interchangeable.
12. If k = radius of gyration of a body, q = distance from the axis of oscillation of the centre of percussion, and x = distance from the same axis to the centre of gravity, then following relation holds good
- (a) $k = \sqrt{qx}$ (b) $k = \frac{qx}{2}$
 (c) $k = \frac{q+x}{2}$ (d) $k = \sqrt{\frac{qx}{2}}$
 (e) $k = \sqrt{\frac{q}{x}}$.
13. If I_1, I_2 and I_3 represent the principal moments of inertia of a gyroscope spinning with a constant angular velocity ω_1 about axis 1, and if the gyroscope is about the third axis, then a

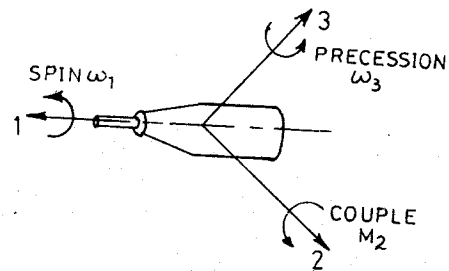


Fig. 2

vector moment results along the second axis such that $M_2 =$

- (a) $I_2 \left(\frac{d\omega_2}{dt} \right) + (I_1 - I_3) \omega_3 \omega_1$
 (b) $I_2 \frac{d\omega_2}{dt} + (I_1 - I_3) \omega_2$
 (c) $I_2 \frac{d\omega_2}{dt} + (I_1 - I_3) \omega_3$
 (d) $I_1 \frac{d\omega_1}{dt} + (I_2 - I_3) \omega_2 \omega_3$
 (e) $I_3 \frac{d\omega_1}{dt} + (I_2 - I_3) \omega_2 \omega_3$.
- (subscripts 1, 2 and 3 represent a right-hand set of reference axes)
14. For a symmetrical body having M.I. = I in all three mutually perpendicular planes, if axes of spin and percussion are at right angles having rate of spin = ω and rate of spin = Ω , the gyroscopic moment is equal to
- (a) $I\omega\Omega$ (b) $I\omega/\Omega$
 (c) $I\omega/\omega$ (d) $I(\omega\Omega)^2$
 (e) $I/\omega\Omega$.
15. The coefficient of friction at higher velocities, with increase in velocity
- (a) increases
 (b) decreases
 (c) remains unaffected
 (d) increases first and then decreases
 (e) may increase/decrease depending on pressure acting on the surfaces.
16. The hydraulic radius of a pipe of diameter ' D ' flowing full is
- (a) D (b) $D/2$
 (c) $D/3$ (d) $D/4$
 (e) $D/8$.

17. The velocity profiles for laminar flow and turbulent flow respectively are
 (a) parabolic, logarithmic
 (b) logarithmic, parabolic
 (c) linear, parabolic (d) logarithmic, linear
 (e) elliptical, logarithmic.
18. The hydraulic radius of a circular pipe is equal to
 (a) its diameter (D) (b) $D/2$
 (c) $D/4$ (d) $D/3$
 (e) $2D/3$.
19. In the case of orifice plates, the maximum differential is obtained by using following types of tap offs
 (a) $1D, \frac{1}{2}D$ taps
 (b) $\frac{1}{2}D, D$ taps
 (c) flange taps
 (d) vena contracta taps
 (e) $1D, 1D$ taps.
20. In a siphon, the air pump or ejector is operated occasionally to remove accumulated air and vapour for priming the pipe. This is done
 (a) to increase flow
 (b) to increase head of siphon
 (c) to increase efficiency of the system
 (d) to reduce noise
 (e) because the flow will not take place unless the siphon is full of water
21. The divergent cone in venturi tube is provided to reduce the overall pressure loss of the meter. The coefficient of discharge, due to removal of the divergent cone will
 (a) increase (b) decrease
 (c) unpredictable (d) remain unaffected
 (e) may increase / decrease depending on other considerations.
22. Whether the flow in an open-channel is critical, subcritical, or super critical is determined by
 (a) Weber number (b) Reynold number
 (c) Mach number (d) Froude number
 (e) Hydraulic gradient.
23. In the case of open channel flow, the specific energy is defined as the energy of the fluid
 (a) referred to the bottom of the channel as the datum
 (b) divided by density
 (c) divided by static head
 (d) added with static head
 (e) divided by the flow rate.
24. For monoatomic gases, the specific heats with rise in temperature
 (a) increase
 (b) decrease
 (c) remain unchanged
 (d) first increase and then decrease
 (e) first decrease and then increase.
25. If Q_1 is the heat input at temperature T_1 to a Carnot engine and Q_2 is the heat rejected at temperature T_2 , then which of the following is the correct statement
 (a) $\frac{Q_1}{T_1} - \frac{Q_2}{T_2} = \text{constant}$
 (b) $\frac{Q_1}{T_1} = \frac{Q_2}{T_2}$ (c) $\frac{Q_1}{T_1} + \frac{Q_2}{T_2} = 0$
 (d) $\frac{Q_1 - Q_2}{T_1 - T_2} = \text{constant}$
 (e) $Q_1 \times T_1 = Q_2 \times T_2$.
26. If T_0 is the lowest available temperature for heat discard and Δs the net change in entropy, then the increase in unavailable energy in thermodynamic process will be equal to
 (a) $T/\Delta s$ (b) $T_0 \times \Delta s$
 (c) $\Delta s/T_0$ (d) $1 - T_0 \times \Delta s$
 (e) $\frac{1 + T_0 \times \Delta s}{T_0 \times \Delta s}$.
27. Free energy or the Helmholtz function in thermodynamic processes is defined as
 (a) $u - TS$ (b) $u + TS$
 (c) $u + pv$ (d) $h - TS$
 (e) $TS - u$.
 (where u = internal energy,
 T = temperature
 and S = entropy)
28. Availability of a system or quantity of energy in a thermodynamic process is defined by
 (a) Gibbs function
 (b) Helmholtz function
 (c) Maxwell equation
 (d) Clapeyron equation
 (e) Carnot cycle.
29. According to first law of thermodynamics
 (a) whenever energy is transformed from one form to another, energy is always conserved

- (b) energy can neither be created nor destroyed
 (c) the sum total of all energy remains constant
 (d) any one of the above
 (e) none of the above.
30. The free enthalpy or Gibbs function is defined as
 (a) $h - TS$ (b) $u - TS$
 (c) $pv + TS$ (d) $h + TS$
 (e) $u + TS$.
 (where h = enthalpy, u = internal energy, T = temperature, s = entropy, p = pressure, v = volume).
31. Which of the following cycle is used as the basis for analysis of gas turbine operation
 (a) Carnot (b) Otto
 (c) Diesel (d) Joule
 (e) Stirling.
32. The discharge of saturated steam through an orifice, in terms of the area of orifice and steam inlet pressure is expressed by
 (a) Napier's equation
 (b) Grashoff's formula
 (c) Rateau's formula
 (d) any one of the above
 (e) none of the above.
33. When steam expands rapidly in turbine nozzles, it becomes supersaturated (*i.e.* the condensation required by the ordinary theory of adiabatic expansion does not occur on account of the rapidity of expansion). The effect of supersaturation in turbines is
 (a) increase in efficiency
 (b) increase in dryness fraction
 (c) loss of energy (d) increase of energy
 (e) heating of steam.
34. For every gas, there is one temperature at which no temperature change occurs during a Joule-Thomson expansion. Below this temperature, a gas cools on throttling and above this, its temperature rises. The temperature at which no temperature change occurs is known as
 (a) saturation temperature
 (b) throttling temperature
 (c) supersaturation temperature
 (d) isotatic temperature
 (e) inversion temperature.
35. If dT be the drop in temperature and dp the drop in pressure in a throttling process, then Joule-Thomson coefficient is defined as
 (a) $\frac{dp}{dT}$ (b) $\frac{dT}{dp}$
 (c) $1 + \frac{dp}{dT}$ (d) $1 + \frac{dT}{dp}$
 (e) $1 - \frac{dT}{dp}$.
36. The isentropic expansion of superheated steam is fairly represented by $pv^n = \text{constant}$, when $n =$
 (a) 1.315 (b) 1
 (c) 1.27 (d) 1.41
 (e) 1.35.
37. In Fig. 3, line AB represents the following process
 (a) heating above the dew point
 (b) cooling above the dew point
 (c) cooling below dew point (dehumidification)
 (d) cooling and dehumidifying
 (e) humidification (adiabatic saturation).
38. In Fig. 3 line BA represents the following process

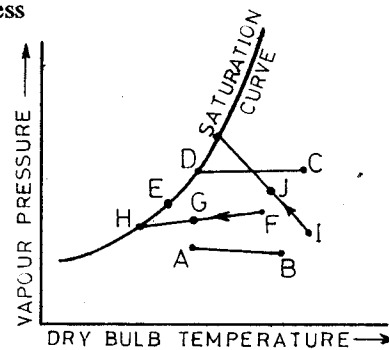


Fig. 3

- (a) heating above the dew point
 (b) cooling above the dew point
 (c) cooling below dew point (dehumidification)
 (d) cooling and dehumidifying
 (e) humidification (adiabatic saturation).
39. In Fig. 3 line CDE represents the following process
 (a) heating above the dew point
 (b) cooling above the dew point
 (c) cooling below dew point (dehumidification)

- (d) cooling and dehumidifying
(e) humidification (adiabatic saturation).
40. In Fig. 3, line *FGH* represents the following process
(a) heating above the dew point
(b) cooling above the dew point
(c) cooling below dew point (dehumidification)
(d) cooling and dehumidifying
(e) humidification (adiabatic saturation).
41. In Fig. 3, line *IJ* represents the following process
(a) heating above the dew point
(b) cooling above the dew point
(c) cooling below dew point (dehumidification)
(d) cooling and dehumidifying
(e) humidification (adiabatic saturation).
42. In the case of orifice plates/nozzles, with fixed inlet pressure, the flow increases as the discharge pressure is decreased upto the critical pressure, beyond which it does not increase. The ratio of critical pressure to inlet pressure for gases, saturated steam, and for moderately superheated steam respectively are
(a) 0.53, 0.575, 0.55
(b) 0.55, 0.575, 0.53
(c) 0.575, 0.53, 0.55
(d) 0.53, 0.55, 0.575
(e) 0.55, 0.53, 0.575.
43. If *C*, *H* and *O* be the parts of carbon, hydrogen and oxygen in a fuel then the minimum amount of air required for complete combustion is
(a) $2.67C + 8H - O$
(b) $C + 2.67H - 8 \times O$
(c) $2.67C + 2H + O$
(d) $\frac{2.67C + 8H - O}{0.23}$
(e) $0.23(2.67C + 8H - O)$.
44. If a fuel is carbon, then the combined CO_2 and O_2 is following %age by volume of the gaseous products
(a) 17% (b) 20%
(c) 21% (d) 23%
(e) 25%.
45. The nitrogen content of the flue gases with increase in hydrogen in a fuel will
(a) increase (b) decrease
(c) remain unaffected
(d) first increase and then decrease
(e) unpredictable.
46. Which of the following materials generally exhibit a yield point
(a) annealed or hot-rolled mild steel
(b) cast iron (c) soft brass
(d) cold-rolled steel (e) hard bronze.
47. Cup-and-cone fracture occurs in the case of
(a) cast iron
(b) round specimens of ductile metal
(c) tough steel
(d) flat tensile specimens of ductile metals
(e) soft brass.
48. The ratio of specimen gauge and square root of cross-sectional area in case of flat-and round-section specimens for tensile tests is taken as
(a) 2.5 (b) 3.5
(c) 4.5 (d) 5.5
(e) 6.5.
49. If a specimen is first plastically strained in tension, its yield stress in compression is reduced and *vice versa*. This behaviour is known as,
(a) Bauschinger effect
(b) Poisson effect
(c) Work-hardening exponent
(d) Creep effect
(e) Stress recovery.
50. In Vickers method of hardness testing, the indenter, is a diamond in the form of a square pyramid with an apical angle of 13° . If *P* be the impressed load in kg and *d* the diagonal of indentation in mm, then Vickers hardness number is
(a) $P/0.5393d$ (b) P/d^2
(c) $P/\pi d^2$ (d) $\pi P/d$
(e) $0.5393P/d$.
51. Work hardenability of a material can be determined by
(a) Rockwell hardness test
(b) Vickers pyramid test
(c) Scleroscope
(d) Herbert pendulum
(e) Brinell hardness.
52. Pick out the wrong relationship
(a) $E = 2G(1 + \mu)$ (b) $G = E/2(1 - \mu)$

- (c) $\mu = (E - 2G) / 2G$ (d) $K = E/3 (1 - 2\mu)$
 (e) $\mu = (3K - E) / 6K$.
 E = modulus of elasticity in tension or compression, G = modulus of elasticity in shear, K = bulk modulus of elasticity, μ = poisson's ratio.
53. Materials having elongation less than 5% are called brittle. In such cases, factor of safety is based on
 (a) yield stress
 (b) endurance limit
 (c) limit of proportionality
 (d) ultimate stress
 (e) proof stress.
54. The stiffness of beam varies as
 (a) $\frac{1}{\text{load } (P)}$, $\frac{1}{(\text{span}, l)^3}$ and $(\text{depth}, h)^3$
 (b) $\frac{1}{P}$, $\frac{1}{l^2}$, h^2 (c) P , l^3 , h^3
 (d) $\frac{1}{P}$, $\frac{1}{l^2}$, $\frac{1}{h^3}$ (e) $\frac{1}{P}$, $\frac{1}{l^3}$, h^3 .
55. If the span of a beam is constant, a shallow beam compared to a deeper beam will be subjected to
 (a) less deformation
 (b) greater deformation
 (c) more or less same deformation
 (d) equal deformation
 (e) unpredictable.
56. If depth of a beam is constant, then a beam of double span will attain a given deflection with
 (a) one-quarter the stress
 (b) half the stress
 (c) one-eighth the stress
 (d) one-third the stress
 (e) one-sixth the stress.
57. In the beams, the other factors remaining same, the deflection varies as
 (a) $\frac{1}{\text{stress } (s)}$ and $\frac{1}{\text{modulus of elasticity } (E)}$
 (b) $s, \frac{1}{E}$ (c) $s^2, \frac{1}{E}$
 (d) $s, \frac{1}{E}$ (e) s, E .
58. The five curves in loading of beams are so related that each curve is derived from the previous one by a process of graphical integration. These five curves in the correct order are
 (a) load, shear, moment, slope, and deflection
 (b) load, moment, shear, slope, and deflection
 (c) load, shear, slope, moment and deflection
 (d) load, shear, moment, deflection and slope
 (e) load, shear, slope, moment and deflection.
59. Continuous beams as compared to simple beams are
 (a) weaker (b) much stiffer
 (c) uneconomical (d) more shallow
 (e) more wide.
60. Maxwell's theorem and Castigliano's theorems are concerned with determining
 (a) shear stress in stepped shafts
 (b) stiffness of complex columns
 (c) deflection of beam carrying several loads
 (d) principal stresses
 (e) fatigue and creep stresses.
61. In the case of round columns, the critical slenderness ratio falls between
 (a) 20 and 30 (b) 30 and 50
 (c) 50 and 80 (d) 80 and 120
 (e) 120 and 150.
62. A force or stress is considered suddenly applied when the duration of load application is
 (a) same
 (b) more than half
 (c) less than one half
 (d) less than one-fourth
 (e) less than one-eighth.
 of the fundamental period of vibration of the member upon which the force acts.
63. The following theories of failure are generally used for ductile and brittle materials respectively
 (a) maximum-shear theory, maximum stress theory
 (b) maximum stress theory, maximum-shear theory
 (c) maximum-strain-energy theory, maximum-shear theory
 (d) maximum-distortion-energy theory, maximum-strain-energy theory
 (e) maximum strain theory, maximum stress theory.

64. If ω_s be the critical speed of the shaft alone, ω_1 be the critical speed of the shaft carrying only weight W_1 , ω_2 the critical speed of the shaft carrying only weight W_2 etc. then according to Dunkerley, the natural frequency ω of lateral vibration of shafts carrying several weights is given as
- (a) $\omega = \omega_s + \omega_1 + \omega_2 + \omega_3 \dots$
 (b) $\frac{1}{\omega} = \frac{1}{\omega_s} + \frac{1}{\omega_1} + \frac{1}{\omega_2} + \frac{1}{\omega_3} + \dots$
 (c) $\omega^2 = \omega_s^2 + \omega_1^2 + \omega_2^2 + \omega_3^2 + \dots$
 (d) $\frac{1}{\omega^2} = \frac{1}{\omega_s^2} + \frac{1}{\omega_1^2} + \frac{1}{\omega_2^2} + \frac{1}{\omega_3^2} + \dots$
 (e) $\frac{1}{\omega^{3/2}} = \frac{1}{\omega_s^{3/2}} + \frac{1}{\omega_1^{3/2}} + \frac{1}{\omega_2^{3/2}} + \frac{1}{\omega_3^{3/2}} + \dots$
65. If δ is the static deflection of the shaft at the shaft at the position where the mass is considered to be concentrated, then the critical speed is proportional to
- (a) δ (b) δ^2
 (c) $\sqrt{\delta}$ (d) $1/\delta^{3/2}$
 (e) $1/\sqrt{\delta}$.
66. If A be the area of membrane then the frequency of the fundamental mode of vibration of the membrane is proportional to
- (a) A (b) \sqrt{A}
 (c) $A^{3/2}$ (d) $\frac{1}{\sqrt{A}}$
 (e) $\frac{1}{A^{3/2}}$.
67. Accelerometers are high-natural frequency instruments but displacement and velocity instruments are low-natural frequency devices. Their useful range respectively is in the region $\frac{\omega}{\omega_n}$
- (a) $\gg 1$ and $\ll 1$
 (b) $\ll 1$, $\gg 1$
 (c) always more than 1
 (d) always less than 1
 (e) always near 1.
68. In drilling and tapping cast iron for studs, it is necessary to tap to a particular depth, so that the strength of the cast iron threads in shear may equal the tensile strength of the bolt. The depth in terms of stud diameter is
- (a) 1 time (b) 1.5 times
 (c) 2 times (d) 2.5 times
 (e) 3 times.
69. In rivetted joints, butt joints are usually preferred over lap joints. The reason for this is that
- (a) butt joint is neat
 (b) joint efficiency is more in the case of butt joint
 (c) it is convenient to make butt joint
 (d) lap joint usually fails due to severe stresses in the rivet
 (e) butt joint is symmetrical.
70. Which is the preferred method for making hole in plate for rivetted joints
- (a) punching (b) reaming
 (c) punching and reaming
 (d) drilling (e) tapping.
71. Pick out the wrong statement about various types of keys
- (a) Woodruff keys are made to facilitate removal of pulleys from shafts
 (b) Gib head keys are necessary when the smaller end is inaccessible for drifting out and the larger end is accessible
 (c) Sunk keys are adapted particularly to the case of hubs fitting adjacent parts with neither ends of the key accessible
 (d) Feather keys are used to prevent parts from turning on a shaft while allowing them to move in a lengthwise direction
 (e) Saddle keys and flat keys are used only for the transmission of small torques that are liable to sudden changes in magnitude.
72. The torque transmitting capacity of involute splines is proportional to
- (a) pitch diameter D
 (b) \sqrt{D} (c) $D^{3/2}$
 (d) D^2 (e) $\frac{1}{D^2}$.
73. The ultimate tensile strength of leather used in belts varies from
- (a) 20 to 30 kg/cm²
 (b) 30 to 60 kg/cm²
 (c) 60 to 100 kg/cm²
 (d) 100 to 200 kg/cm²
 (e) 200 to 330 kg/cm².
74. Pivoted motor drive (Rockwood drive) is used to

- (a) maintain proper belt tension on short-centre drives
 (b) increase efficiency of transmission
 (c) reduce friction losses
 (d) adjust speed ratio
 (e) vary the centre distance between drive and driven pulleys.
75. Pick up the wrong statement. The advantage of finished steel roller chains is
 (a) high efficiency
 (b) maintain proper tension
 (c) no slippage
 (d) permit motion in either direction
 (e) no initial tension required.
76. In the roller chain drives, the effect of centrifugal pull is not considered because
 (a) it travels at low speed
 (b) it is low power transmission device
 (c) no slip takes place
 (d) it is light in relation to tensile strength
 (e) there is no friction between chain and the sprocket wheel.
77. The flywheel weight is proportional to
 (a) speed (rpm) N (b) N^2
 (c) $\frac{1}{N}$ (d) \sqrt{N}
 (e) $\frac{1}{N^2}$.
78. Herringbone gears are designed for
 (a) high transmission efficiency
 (b) high speed reduction
 (c) transmitting motion between two shafts inclined at any angle
 (d) remove the end thrust of the shaft in the case of helical gears used to connect parallel shafts
 (e) acting as master gears for comparison purposes.
79. In order to lower the friction losses in journals running at high speed, the diametral clearance should be equal to
 (a) $0.02d$ (d = shaft diameter)
 (b) $0.001d$ (c) $0.002d$
 (d) $0.0002d$ (e) $0.05d$.
80. Oilless bearings refer to
 (a) journal bearings
 (b) ball and roller bearings
 (c) thrust bearings
 (d) self-lubricating bearings
 (e) pivoted segmental thrust bearings.
81. Basic dynamic load of a ball/roller bearings determines its
 (a) rpm (b) life expectancy
 (c) axial thrust (d) stress
 (e) size of bearings.
82. Which of the following does not pertain to experimental stress analysis method
 (a) photoelasticity (b) brittle coating
 (c) holography (d) fluoroscopy
 (e) photoelasticity.
83. Acoustic - signatures analysis involves the analysis of sound energy emitted from an object to determine
 (a) characteristics of an object
 (b) thickness (c) stress distribution
 (d) flaws
 (e) manufacturing defects.
84. Materials capable of being tested by ultrasonic energy are those which
 (a) absorb vibrational energy
 (b) vibrate
 (c) transmit vibrational energy
 (d) reflect vibrational energy
 (e) magnify vibrational energy.
85. The maximum atomic number of all the chemical elements is 102. The element with atomic number 102 is
 (a) Nobelium (b) Mendeleevium
 (c) Fermium (d) Einsteinium
 (e) Californium.
86. The maximum atomic weight of all the chemical elements is 238.03. The element with atomic weight of 238.03 is
 (a) Thorium (b) Uranium
 (c) Mercury (d) Lead
 (e) Iridium.
87. Purest form of iron is
 (a) wrought iron (b) pig iron
 (c) bessemer steel (d) electrolytic iron
 (e) nodular cast iron.
88. Iron ore is reduced in a blast furnace to produce
 (a) pure iron (b) pig iron
 (c) cast iron (d) malleable iron
 (e) wrought iron.
89. Steels in which no gas evolution occurs on solidification are called

- (a) piped steel (b) rimmed steel
(c) capped steel (d) killed steel
(e) semikilled steel.
90. Improper pouring conditions such as splashing of steel in the moulds will form
(a) segregation (b) seams
(c) scabs (d) pipes
(e) laps.
91. The steel rolled product of size 30 to 150 mm square is called
(a) bloom (b) billet
(c) slab (d) skelp
(e) channel.
92. In hot extrusion following is used as lubricant
(a) phosphate coating
(b) carbon (c) glass
(d) lead (e) lub oil.
93. The gamma iron containing elements in solid solution is called
(a) ferrite (b) cementite
(c) austenite (d) pearlite
(e) merrisite.
94. The temperatures at which the phase changes occur in a metal are called
(a) recrystallisation temperatures
(b) phase transformation temperatures
(c) transition temperatures
(d) critical temperatures
(e) allotropic temperatures
95. Which of the following is not the function of annealing
(a) to remove stresses and gases
(b) to induce softness
(c) to alter ductility, toughness, electrical, magnetic or other physical properties
(d) to refine the crystalline structure and produce a definite microstructure
(e) to act as a treatment to precede further wire drawing.
96. The operation of heating iron-base alloys to a temperature below or close to the lower limit of the critical temperature range followed by slow cooling is called
(a) Annealing
(b) Full annealing
(c) process annealing
(d) normalising
(e) patenting.
97. The characteristic of steel that determines its capacity to harden throughout the section when quenched is called hardenability. This is determined by
(a) Jminy hardenability test
(b) Sceleroscope
(c) Maxwell hardenability test
(d) Mc Quaid Ehn test
(e) Rockwell test.
98. Pick out the wrong statement about the effect of grain size developed during heat treatment on the physical properties of steel. In steels of similar chemical analysis, the steel developing the finer austenitic grain size will have
(a) a lower hardenability
(b) greater toughness
(c) show less tendency to crack or warp on quenching
(d) less susceptibility to grinding cracks and have lower internal stresses
(e) retain more austenite than coarse-grained steel.
99. Carbon steel with carbon content of 0.90 to 1.00% is used for applications like
(a) rivets, screws etc
(b) files, ball races, mandrels, drawing dies, razors, etc.
(c) structural steel, plate, forgings such as cam shaft
(d) springs, reamers, broaches, small punches, dies, etc.
(e) twist drills, small taps, threading dies, cutlery, small lathe tools etc.
100. An "orange-peel" effect is observed
(a) when cutting tool is suddenly quenched
(b) during hardening a steel
(c) when parts are subjected to corrosion stressing
(d) while deep-drawing the sheet having large grain size
(e) as casting/welding defect.
101. Stretcher strains or Luders lines are observed
(a) due to sudden local elongations in the sheet during forming because of sharp yield point characteristics of low carbon steel
(b) during faulty heat treatment
(c) as casting defects
(d) while processing plastics
(e) while extruding a metal through a die.

- 102.** Aging the steel refers to
 (a) eating away of steel by corrosion
 (b) the return of the sharp yield point in temper-rolled low-carbon sheets after a period of time
 (c) relieving of stress from cast product by allowing them to idle for some time
 (d) decarburisation of steel by overheating
 (e) failure of structure by overstressing.
- 103.** The silicon in steel increases its electrical resistivity and greatly decreases the hysteresis loss. The silicon-alloy sheets are used in almost all magnetic circuits where alternating current is used. The percentage of silicon in transformers and motor armatures respectively is
 (a) 5%, 4% (b) 4%, 5%
 (c) 2%, 3% (d) 3%, 2%
 (e) 6%, 5%.
- 104.** Invar has an exceedingly low coefficient of linear expansion. The %age of nickel in it is
 (a) 5% (b) 12%
 (c) 27% (d) 36%
 (e) 48%.
- 105.** Perminvar has a constant permeability over a range of flux densities. The % age of nickel and cobalt in it are
 (a) 45% Ni, and 25% CO
 (b) 25% Ni, and 45% CO
 (c) 50% NI, and 50% CO
 (d) 25% Ni, and 75% CO
 (e) 75% Ni, and 25% CO.
- 106.** Three most common tin bronzes are known as alloys A, C and D. These respectively contain following percentage of tin
 (a) 2, 3, 5 (b) 4, 6, 8
 (c) 5, 8, 10 (d) 7, 9, 12
 (e) 12, 18, 23.
- 107.** Season cracking is the spontaneous cracking, occurring on exposure to atmospheric corrosion in brass objects with high residual tensile stress at the surface. Parts susceptible to season cracking contain following content of zinc
 (a) minor traces (b) less than 5%
 (c) around 5 to 10% (d) below 15 to 20%
 (e) above 20%.
- 108.** Alloys with over 80% copper are generally more
 (a) resistant to corrosion
 (b) prone to season cracking
 (c) machinable
 (d) abrasion resistant
 (e) hot workable with high strength.
- 109.** Aluminium can be hardened by
 (a) hot working (b) cold working
 (c) heat treatment
 (d) precipitation hardening treatment
 (e) solution heat treatment.
- 110.** Duralumin hardens spontaneously after solution heat treatment at
 (a) room temperature
 (b) just below recrystallisation temperature
 (c) above recrystallisation temperature
 (d) critical point
 (e) near melting point.
- 111.** On a weight basis, the electrical conductance of aluminium as compared to that of copper is
 (a) 50% (b) 62%
 (c) 90% (d) 150%
 (e) 200%.
- 112.** Pick out the wrong statement about Titanium alloys
 (a) These have strength comparable with alloy steel while weight is only 60% that of steel
 (b) These have excellent corrosion resistance
 (c) These have high magnetic permeability
 (d) These have become important structural metals
 (e) These are in use for over past two centuries.
- 113.** Babbit metal is a general term used for
 (a) soft tin and lead-base alloys
 (b) copper and lead alloys
 (c) tin and magnesium alloys
 (d) aluminium and nickel alloys
 (e) brass and silver alloys.
- 114.** Superalloys are used in applications demanding high strength at high temperatures and are based on
 (a) nickel and/or cobalt with chromium etc
 (c) titanium and boron
 (c) cobalt and tungsten
 (d) columbium and chromium
 (e) zirconium and molybdenum.

115. Cast tool alloys have high-temperature strength and wear resistance. They are principally alloys of
 (a) nickel, cobalt and chromium
 (b) cobalt, chromium and tungsten
 (c) tungsten, chromium and molybdenum
 (d) columbium and zirconium
 (e) cobalt, boron and aluminium.
116. Which of the following has the highest melting point
 (a) Tantalum (b) Molybdenum
 (c) Columbium (d) Tungsten
 (e) Zirconium.
117. Which of the following is not used as control-rod material in nuclear power plants
 (a) boron (b) cobalt
 (c) cadmium (d) hafnium
 (e) gadolinium.
118. The modulus of elasticity is the highest (nearly 7×10^6 kg/cm²) for
 (a) stainless steel (b) superalloys
 (c) cast tool alloys (d) tungsten carbide
 (e) high speed steel.
119. Hydrogen in steam in thermal power plants is an index to the
 (a) rate of corrosion (b) pH value
 (c) excessive dosing (d) scale formation
 (e) embrittlement.
120. The greatest single cause of corrosion in boiler tubes, drum, economisers and superheaters is
 (a) scale formation (b) alkalinity of water
 (c) addition of hydrazine in feed-water
 (d) non condensable gases released from water in boiler
 (e) water leaking into condenser.
121. The pH value of feedwater in boilers is maintained at
 (a) 7 (b) 7'-8
 (c) 6-7 (d) 8.5-9
 (e) 9-10.5.
122. Extreme pressure (EP) lubricants have been developed to take care of high tooth pressures and high rubbing velocities often encountered in hypoid and spur gears. EP lubricants are mineral oils containing
 (a) active or passive held sulphur, phosphorous, and/or chlorine
 (b) antifoam
 (c) molybdenum di-sulphide
 (d) boron
 (e) polyolefins.
123. Many times lub oils are compounded and may contain one or more necessary agents and additives. Which of the following additives has been indicated with wrong function
 (a) dispersants to keep insoluble materials suspended
 (b) detergents to clean mildly or deter deposit formation
 (c) foam inhibitors to increase surface tension
 (d) rust inhibitors to provide protective, water-repellant films
 (e) corrosion inhibitors to neutralise acid materials and form protective films on metal surface.
124. Maximum moisture occurs in following rank of coal
 (a) anthracite (b) bituminous
 (c) sub-bituminous (d) lignite
 (e) unpredictable.
125. The combustion characteristics of diesel fuels are expressed in terms of
 (a) flash point (b) viscosity
 (c) carbon residue (d) cetane number
 (e) distillation temperature.
126. Aerozene 50 is a
 (a) solid fuel (b) liquid fuel
 (c) rocket fuel (d) I.C. engine fuel
 (e) explosive.
127. The dry ash from the heat absorbing horizontal surfaces in boiler can be removed by
 (a) soot blowing using air
 (b) soot blowing using water
 (c) soot blowing using steam
 (d) shot cleaning
 (e) washing.
128. The best suited pulveriser for bituminous coal is
 (a) high-speed pulveriser
 (b) medium-speed pulveriser
 (c) slow-speed pulveriser
 (d) very slow-speed pulveriser
 (e) all of the above.
129. The dividing line between the use of stoker-fired boilers and pulverised-coal firing is the steam raising capacity of

- (a) 20–30 tons/hr (b) 45–70 tons/hr
(c) 80–100 tons/hr (d) 110–130 tons/hr
(e) 150–200 tons/hr.
130. The silica is soluble in steam, and its solubility increases rapidly at temperatures above 260°. Thus it can be transported in a vapour phase into the turbine and deposited on the turbine blading. For boilers operating at around 175 kg/cm², the limit of silica in boiler water is
(a) 100 p.p.m (b) 10 p.p.m
(c) 5 p.p.m (d) 1 p.p.m
(e) 0.3 p.p.m.
131. Pick out the wrong statement
Steam engine economy may be improved by
(a) separation of inlet and outlet ports
(b) steam jackets
(c) multiple expansion
(d) using saturated steam
(e) uniflow arrangement.
132. Flame speed in spark ignition engines is of the order of
(a) 7 to 12 m/sec (b) 15 to 30 m/sec
(c) 35 to 50 m/sec (d) 60 to 100 m/sec
(e) 110 to 160 m/sec.
133. The most effective knock suppressor is
(a) Tetraethyl lead (b) Benzene
(c) Toluene (d) Xylene
(e) Ethyl iodide.
134. In a carburettor, the float-chamber fuel level in comparison to the outlet of the fuel jet is
(a) exactly at same level
(b) slightly below
(c) slightly above
(d) either above or below depending on the rating
(e) there is no such criterion.
135. The spark advance increases with
(a) increase in speed (b) decrease in speed
(c) decrease in manifold vacuum
(d) decrease in both speed and manifold vacuum
(e) increase in both speed and manifold vacuum.
136. In I.C. engines, the ratio of compression pressure and the intake manifold pressure is
(a) same as compression ratio (r)
(b) $> r$ (c) $< r$
(d) $= r$
(e) has no relationship with r .
137. The compression ratio in spark ignition engines is limited to 6 : 1 to 12 : 1 because of limitations of
(a) carburettor (b) fuel injector
(c) cylinder design
(d) combustion knock of the fuel-air mixture
(e) ignition system.
138. Pick out the wrong statement about the advantages of C.I. engines
(a) low specific fuel consumption
(b) low specific weight
(c) high thermal efficiency at part loads
(d) no preignition
(e) low CO and hydrocarbon emission at low and moderate loads.
139. Pick out the correct statement.
Knock reduction requires
(a) long ignition lags in S.I. engines and short ignition lags in C.I. engines
(b) long ignition lags in C.I. engines and short ignition lags in S.I. engine
(c) long ignition lags in both S.I. and C.I. engines
(d) short ignition lags in both S.I. and C.I. engines
(e) zero ignition lags in both S.I. and C.I. engines.
140. The addition of a regenerator in a gas turbine results in
(a) improvement of efficiency
(b) increase in output of a given size of gas turbine
(c) high life of gas turbine
(d) increased pressure ratio
(e) less heating loss.
141. The additions of intercooling in the compressor and reheat of the working fluid during expansion in a gas turbine result in
(a) improvement of efficiency
(b) increase in output of a given size of gas turbine
(c) high life of gas turbine
(d) increased pressure ratio
(e) less leaving loss.
142. As the turbine inlet temperature increases, the optimum pressure ratio (corresponding to maximum thermal efficiency)

- (a) increases (b) decreases
 (c) remains unchanged
 (d) increases upto certain stage and then decreases
 (e) decreases upto certain stage and then increases.
143. Pick up the wrong statement about advantages of open type gas turbine plant
 (a) simple control
 (b) simple sealing system
 (c) high power-to weight ratio
 (d) constant efficiency over a wide load range
 (e) operation of plant without cooling water.
144. Pick up the wrong statement about advantages/characteristics of single shaft gas turbine
 (a) It is the simplest arrangement
 (b) All the rotating elements operate as a single assembly
 (c) It is best suited for wide load-speed range
 (d) Minimum operating speed is set by the stall (pumping limit) characteristic of the compressor
 (e) Maximum power is set by the maximum allowable gas-turbine inlet temperature.
145. Boiling water reactors in comparison to pressurised-water reactors of similar rating are
 (a) lighter and smaller
 (b) lighter but larger
 (c) heavier and larger
 (d) heavier but smaller
 (e) of similar size and weight.
146. In fast breeder reactors
 (a) whole of fuel is consumed
 (b) fuel is partly consumed
 (c) no fuel is consumed
 (d) more fuel than consumed is produced
 (e) fuel is not required.
147. The main objective of reactor design is to achieve following condition during reactor operation
 (a) achieve neutron balance
 (b) achieve neutron surplus condition
 (c) achieve neutron deficient condition
 (d) not to allow any neutrons to leak
 (e) not to allow any neutrons to be absorbed.
148. If diameter of runner of a hydraulic turbine is doubled, then power, speed and discharge respectively will be following times
 (a) $4, \frac{1}{2}, 4$ (b) $2, \frac{1}{2}, 4$
 (c) $4, \frac{1}{2}, 2$ (d) $2, \frac{1}{2}, 2$
 (e) 4, 1, 4
149. If H is the head available for a hydraulic turbine, then power, speed and discharge, respectively are proportional to
 (a) $H^{3/2}, H^{1/2}, H^{1/2}$ (b) $H^{1/2}, H^{3/2}, H^{1/2}$
 (c) $H^{1/2}, H^{1/2}, H^{3/2}$ (d) $H, H^2, H^{1/3}, H^{1/2}$
 (e) $H^2, H^{1/2}, H^2$.
150. Which of the following hydraulic turbines has best efficiency even at low loads
 (a) Francis, low specific speed
 (b) Francis, medium specific speed
 (c) Francis, high specific speed
 (d) Fixed blade propeller
 (e) Adjustable blade propeller.
151. Which of the following specific speed turbine is best suited for widely varying heads
 (a) low specific speeds
 (b) medium specific speeds
 (c) higher specific speeds
 (d) zero specific speeds
 (e) there is no such relationship.
152. Runaway speed of various types of hydraulic turbines as compared to their normal speed may be of the order of
 (a) 110 to 160% (b) 170 to 290%
 (c) 300 to 360% (d) 370 to 450%
 (e) 460 to 550%.
153. The impulse type hydraulic turbine is used for following heads and their run away speed in comparison to normal speed respectively are
 (a) above 500 m, 160 to 190%
 (b) below 100 m, 170 to 300%
 (c) below 30 m, 110 to 150%
 (d) around 200 m, 120 to 160%
 (e) between 100-300 m, 200 to 300%.
154. Pyranometer is used to measure
 (a) the total radiation from sun and sky
 (b) composition of alloys
 (c) flow of viscous fluids
 (d) brightness of a light source
 (e) smoothness of a surface.
155. Heliotechnology is concerned with

- (a) space science
 (b) temperatures below 0°C
 (c) solar energy utilisation
 (d) nuclear power generation
 (e) heat transfer mechanism.
156. Hydrophone is a device used to
 (a) convert mechanical energy of liquid to electrical energy
 (b) convert mechanical energy of gases to electrical energy
 (c) transmit sound waves through water
 (d) govern hydraulic turbines
 (e) convert sea energy into useful form.
157. Decibel is a unit to measure
 (a) intensity of light (b) alkalinity in water
 (c) sound intensity (d) velocity of sound
 (e) solar radiation.
158. Tumbler gear is concerned with
 (a) automobiles (b) aeroplanes
 (c) lathe (d) ships
 (e) war vehicles.
159. A fly cutter is used on following machine tool
 (a) shaper (b) lathe
 (c) broaching machine
 (d) gear cutting machine
 (e) milling machine.
160. Power from the leadscrew to the carriage in lathe is transmitted through
 (a) bevel gear (b) worm and gear
 (c) tumbler gear (d) half nut
 (e) full nut.
161. A cutting tool is designated as 6°-8°-5°-6°-10°-72°-1.5 mm. The side cutting edge angle of the tool is
 (a) 0° (b) 8°
 (c) 5° (d) 10°
 (e) 72°.
162. The angle made by the face of the tool and the plane parallel to the base of the cutting tool, is known as
 (a) cutting angle (b) face angle
 (c) clearance angle (d) rake angle
 (e) lip angle.
163. If ϕ be shear angle, r the chip thickness ratio and α the rake angle of the tool, then
 (a) $\tan \phi = \frac{r \cos \alpha}{1 - r \sin \alpha}$
 (b) $\tan \phi = \frac{r \cos \alpha}{1 + r \sin \alpha}$
 (c) $\tan \phi = \frac{r \sin \alpha}{1 - r \cos \alpha}$
 (d) $\tan \phi = \frac{r \sin \alpha}{1 + r \cos \alpha}$
 (e) $\tan \phi = \frac{1 - r \sin \alpha}{r \cos \alpha}$
164. The press operation involving turning over of the edges of the steel to provide stiffness and a smooth edge is known as
 (a) bulging (b) slugging
 (c) tumbling (d) hemming
 (e) lancing.
165. Which of the following machines uses fly cutter
 (a) shaper (b) planer
 (c) broacher (d) gear cutter
 (e) milling machine.
166. Permeability of foundry sand refers to
 (a) cohesiveness of sand
 (b) capacity of sand particles to bind together
 (c) porosity to permit gases to escape
 (d) binder distribution in sand
 (e) distribution of vent holes in mould.
167. Grain size of moulding sand is expressed in terms of
 (a) grain fineness number
 (b) maximum grain diameter
 (c) sieve number
 (d) mean grain diameter
 (e) roundness of grain.
168. Toughness of sand is measured by
 (a) shatter test
 (b) depth penetration test
 (c) scheleroscope
 (d) scratch test
 (e) charpy test.
169. The type of pattern used for casting pipes is
 (a) solid (b) split
 (c) sweep (d) consumable type
 (e) no pattern is used.
170. Shear angle is the angle between shear plane and
 (a) vertical (b) horizontal
 (c) job surface (d) tool face
 (e) chip flow plane.

171. Which of the following unconventional machining is reverse of electroplating process
(a) electro discharge machining
(b) electro chemical milling
(c) laser beam machining
(d) plasma cutting (e) wire cut machining.
172. For micro welding applications, the most suitable welding method is
(a) laser beam (b) plasma
(c) ion beam (d) thermit
(e) ultrasonic.
173. In investment casting, the pattern is made of
(a) mercury (b) clay
(c) wood (d) plastic
(e) wax.
174. Cores are used during moulding operation in order to
(a) permit easy removal of pattern
(b) provide desired recess in casting
(c) produce chilled surface
(d) permit escapement of gases during pouring of metal
(e) strengthen the mould.
175. C-14 steel designation means, carbon content in steel is of the order of following percentage
(a) 14% (b) 1.4%
(c) 0.14% (d) 0.1 to 0.18%
(e) 1.3 to 1.5%.
176. A 10 ton press means that
(a) the weight of press is 10 tons
(b) it can handle 10 tons of work per day
(c) its slide can exert pressure of 10 tons
(d) its flywheel weighs 10 tons
(e) it is designed for dead load of 10 tons.
177. Queuing theory is associated with
(a) waiting time (b) inspection time
(c) production time (d) idle time
(e) tool changing time.
178. Bin cards are used in
(a) production shop (b) stores
(c) quality control
(d) preventive maintenance
(e) staff attendance.
179. SIMO Charts are used in
(a) method study
(b) time study
(c) micromotion study
(d) layout analysis
(e) process analysis.
180. Gantt charts are used for
(a) machine utilisation
(b) production schedule
(c) inventory control
(d) forecasting sales
(e) product layout.

Model Test Paper-3

Attempt all the questions. Each question carries equal marks.
Times allowed for each question on an average is 20 seconds.

- 1 Newton is equal to
 - (a) 1 kilogram metre per second squared
 - (b) kg/sec^2
 - (c) $1 \text{ kg}/\text{sec}^2$
 - (d) $1 \text{ gm cm}/\text{sec}$
 - (e) $1 \text{ kg m}/\text{sec}$.
- 1 coulomb is equal to
 - (a) 1 ampere/second
 - (b) $1 \text{ ampere}/\text{second}^2$
 - (c) 1 ampere second
 - (d) 1 ampere/volt
 - (e) 1 ampere volt.
- 1 farad is equal to
 - (a) 1 coulomb per volt²
 - (b) 1 coulomb per volt
 - (c) 1 coulomb per ampere
 - (d) 1 coulomb \times volt
 - (e) 1 coulomb \times ampere.
- 1 henry is equal to
 - (a) 1 volt \times ampere
 - (b) 1 volt per ampere
 - (c) 1 volt per second
 - (d) 1 volt second per ampere²
 - (e) 1 volt second per ampere.
- 1 joule is equal to
 - (a) 1 newton per meter
 - (b) 1 newton per metre²
 - (c) 1 newton \times metre sec
 - (d) 1 newton metre
 - (e) 1 newton per sec.
- Which of the following belongs to elastomer group
 - (a) plastic
 - (b) rubber
 - (c) glass
 - (d) wood
 - (e) concrete.
- Glass wool is used for
 - (a) mirrors
 - (b) decoration purposes
 - (c) packing material
 - (d) heat insulation
 - (e) garments.
- For industrial radiography and in therapy, cobalt-60 is used as a source of
 - (a) X-rays
 - (b) alpha-rays
 - (c) beta-rays
 - (d) gamma-rays
 - (e) microwaves.
- Which of the following does not find application for thermocouple
 - (a) duralumin
 - (b) alumel
 - (c) platinum
 - (d) rhodium
 - (e) constantan.
- Corrosion takes place because
 - (a) it is a natural phenomenon
 - (b) increase in free energy of the reaction takes place
 - (c) corrosion products are more stable than the metals themselves
 - (d) if proper care is not taken during fabrication
 - (e) moisture is present in atmosphere.
- With passage of time, corrosion velocity in an object
 - (a) increases
 - (b) decreases
 - (c) remains constant
 - (d) first decreases and then increases
 - (e) unpredictable.
- Pick out the correct statement about corrosion
 - (a) applied or residual stresses accelerate corrosion
 - (b) flow of larger electrical currents has no effect on corrosion
 - (c) if the temperature is increased, corrosion rate is decreased
 - (d) alternating current is favourable for corrosion

- (e) corrosion takes place with great difficulty at grain boundaries of crystals.
13. In the creep test, the following type of stress is applied to specimen
- uniaxial compressive
 - uniaxial tensile
 - biaxial compressive or tensile
 - alternating stress
 - thermal stress.
14. In creep test, the extension in length of specimen is measured by
- spherometer
 - slide callipers
 - a centimeter scale attached adjacent to the specimen
 - two marks on the gauge length of the specimen through microscope
 - digital read out.
15. Strain-ageing is generally experienced with
- high manganese steels
 - high chromium steels
 - high carbon steels
 - low carbon steels
 - cast iron.
16. Pick up the wrong statement
- The included angle between opposite faces of the pyramid is 136 degree
 - In Brinell hardness testing, the position of the impression taken by the ball on the specimen surface is immaterial. It has no relation with the accuracy of the result
 - The hardness of metal sheet and strip material has been recommended to be determined by both Brinell and Vicker pyramid hardness
 - Brinell or Vicker hardness number is expressed as load divided by the surface area of indentation
 - The Rockwell test is most widely used due to its speed and free from personal error.
17. Pick up the wrong statement
- Rockwell hardness number is directly recorded on a dial gauge but Brinell hardness number is calculated by formula
 - Brale indenter is the term associated with Rockwell test
 - In Rockwell hardness test, the major load applied is 150 kilograms
 - Micro-hardness is measured by Knoop test
 - Scleroscope test is a compression test.
18. "Drift origin theory" explains the origin of
- coal
 - petroleum
 - secondary fuels
 - gaseous fuels
 - nuclear fuel.
19. The location of centre of pressure is always
- above the centroid of the area
 - at the centroid of the area
 - at the top of the area
 - below the centroid of the area
 - at the bottom of the area.
20. Total pressure on a plane horizontal surface of area A at a depth h below the water level is
- wAh
 - $\frac{wAh}{3}$
 - $\frac{wAh}{2}$
 - $\frac{wAh}{4}$
 - $2wAh$
- where w is the specific weight of water.
21. At NTP the bulk modulus of elasticity for water is
- $2.1 \times 10^6 \text{ kg/cm}^2$
 - $2.1 \times 10^3 \text{ kg/cm}^2$
 - $2.1 \times 10^4 \text{ kg/cm}^2$
 - $2.10 \times 10^2 \text{ kg/cm}^2$
 - $2.1 \times 10^5 \text{ kg/cm}^2$.
22. The science which deals with the motion of fluids without considering the forces causing the motion is known as
- Hydro kinematics
 - Hydro kinetics
 - Hydro statics
 - Hydraulics
 - Hydraulic machines.
23. At high Reynolds number
- inertial forces control and viscous forces are unimportant
 - viscous forces predominate
 - inertial forces are unimportant and viscous forces control
 - viscous forces control and inertial forces are unimportant
 - gravity forces control.
24. Nominal size of a pipe is an indication of its
- inner diameter
 - outer diameter
 - approximate diameter
 - all of the above
 - none of the above.

25. Hydraulic radius is the ratio of the wetted area to its
 (a) radius (b) wetted perimeter
 (c) wetted volume (d) wetted top width
 (e) wetted bottom width.
26. Hydraulic depth is the ratio of the wetted area to its
 (a) top width (b) perimeter
 (c) volume (d) radius
 (e) bottom width.
27. Flow of liquids under pressure through long pipe lines of constant diameter is called
 (a) non-uniform flow
 (b) uniform flow
 (c) unsteady non-uniform flow
 (d) steady non-uniform flow
 (e) rotational flow.
28. Flow of liquids through a tapering pipe at constant rate is called
 (a) steady uniform flow
 (b) unsteady uniform flow
 (c) unsteady non-uniform flow
 (d) steady non-uniform flow
 (e) uniform flow.
29. Flow through a tapering pipe at either increasing or decreasing rate is called
 (a) an unsteady non-uniform flow
 (b) an unsteady uniform flow
 (c) a steady uniform flow
 (d) a steady non-uniform flow
 (e) irrotational flow.
30. Which one of the following is considered for measuring low discharge in laboratory channels?
 (a) Cipolletti notch
 (b) triangular or V notch
 (c) rectangular notch
 (d) rectangular weir
 (e) orifice plate.
31. Which is most suitable for transportation of sticky material?
 (a) apron conveyor
 (b) belt conveyor
 (c) screw conveyor
 (d) pneumatic conveyor
 (e) hydraulic conveyor.
32. Discharge in laminar flow through a pipe varies
 (a) as the square of the radius
 (b) inversely as the pressure drop
 (c) inversely as the viscosity
 (d) as the square of the diameter
 (e) as inverse of square of the radius.
33. Which of the following is used in the blast furnace as flux
 (a) fluorspar (b) quartzite
 (c) limestone (d) ferro-manganese
 (e) muntz metal.
34. Pick out the wrong statement
 (a) The tuyeres of a blast furnace is made of bronze
 (b) The basicity of slag may be expressed as $\frac{\text{CaO} + \text{MgO}}{\text{SiO}_2}$
 (c) The calorific value of blast furnace gas is less because it contains more nitrogen
 (d) The mould of steel ingot is made of wrought iron in an integrated steel plant
 (e) If ZnO is present in iron ore, then zinc vapour is produced in the blast furnace and it destroys the lining of the furnace.
35. The quantum of 1 newton force would be equal to as in following application
 (a) lifting brick
 (b) pressing a door bell
 (c) hammering a nail
 (d) hammering a hot iron piece
 (e) pushing a car.
36. 1 pascal is equal to
 (a) 1 newton/metre (b) 1 newton metre
 (c) 1 newton/metre² (d) 1 newton metre²
 (e) 1 kg/m².
37. 1 watt is equal to
 (a) 1 joule/second (b) 1 joule second
 (c) 1 joule/second² (d) 1 joule/metre
 (e) 1 joule/ampere.
38. 1 weber is equal to
 (a) 1 ampere second
 (b) 1 volt second (c) 1 volt/second
 (d) 1 volt/second² (e) 1 volt metre.
39. Moisture can be removed from lubricating oil using
 (a) tubular centrifugal
 (b) clarifier (c) sparkler filter
 (d) vacuum leaf filter
 (e) cyclone separator.
40. Mond process is used for the extraction of

- (a) copper (b) nickel
(c) lead (d) tungsten
(e) zinc.
41. Galena is the sulphide ore of
(a) zinc (b) copper
(c) lead (d) nickel
(e) iron.
42. Cavitation in a centrifugal pump results from
(a) high discharge pressure
(b) low barometric pressure
(c) high discharge velocity
(d) high discharge rate
(e) low power capacity of motor.
43. Which of the following is used for pumping crude oil from oil well ?
(a) single stage centrifugal pump
(b) gear pump (c) screw pump
(d) duplex/triplex reciprocating pump
(e) axial flow pump.
44. A centrifugal pump designed to pump water is employed to pump a more viscous oil. In the latter case, the pump
(a) develops a lower head
(b) capacity is reduced
(c) requires more power
(d) all of the above
(e) none of the above.
45. A rectangular channel section will be most economical when hydraulic radius is equal to
(a) the depth of flow
(b) zero
(c) half the depth of flow
(d) twice the depth of flow
(e) one-third the depth of flow.
46. A triangular channel section is said to be a most economical section when each of its sloping sides makes an angle of
(a) 33° (b) 45°
(c) 66° (d) 15°
(e) $22\frac{1}{2}^\circ$.
with the vertical.
47. In the case of flow in open channels the critical depth of flow is that depth of flow at which the specific energy is
(a) minimum (b) maximum
(c) zero (d) mean
(e) median.
48. Most commonly used joint in underground pipe lines is
(a) sleeve joint (b) couplings
(c) flange (d) expansion joint
(e) welded joint.
49. Check valves are used
(a) for high pressure applications
(b) in bends
(c) for controlling water flow
(d) for unidirectional flow
(e) for mixing two flows.
50. Co-efficient of velocity as compared to the coefficient of discharge is
(a) less (b) more
(c) equal
(d) less or more depending on flow
(e) unpredictable.
51. Air vessel is provided with a reciprocating pump in order to
(a) reduce discharge fluctuation
(b) reduce the danger of cavitation
(c) avoid the necessity of priming
(d) increase the pump efficiency
(e) increase the discharge head.
52. In case of centrifugal fan or blower, the gas capacity varies as
(a) speed (b) $(\text{speed})^2$
(c) $(\text{speed})^{3/2}$ (d) $(\text{speed})^3$
(e) $\sqrt{\text{speed}}$.
53. For a specific centrifugal air blower operating at constant speed and capacity, the power requirement and pressure vary as
(a) gas density (b) $(\text{gas density})^2$
(c) $(\text{gas density})^{3/2}$ (d) $\sqrt{\text{gas density}}$
(e) $1/\text{gas density}$.
54. The most economical valve for use with large diameter pipes carrying water is
(a) butterfly valve (b) globe valve
(c) needle valve (d) gate valve
(e) check valve.
55. Erosion and pits formation on the impeller of a centrifugal pump may be due to
(a) cavitation
(b) high speed of impeller
(c) operation with delivery valve closed for considerable time
(d) off centring of pump with motor
(e) over loading of pump.
56. Principle of superposition is applied to

- (a) any material
 (b) the material which obeys Hooke's law
 (c) any homogeneous material
 (d) rigid bodies only
 (e) plastic materials.
57. If a rectangular bar is subjected to triaxial stresses s_x , s_y and s_z in such a way that the algebraic sum of these stresses is zero, then the change in volume will be equal to
 (a) zero
 (b) 0.33 times the volume of the rectangular bar
 (c) 0.3 times the volume of the rectangular bar
 (d) 0.15 times the volume of the rectangular bar
 (e) 0.01 times the volume of the rectangular bar.
58. Though melting point of iron is 1539°C, iron melts at around 1200°C in blast furnace, because
 (a) carbon monoxide causes to melt it at lower temperature
 (b) iron, in blast furnace conditions, contains impurities like C, Mn, Si, P, S etc.
 (c) slag lowers the melting point of iron
 (d) basic flux is used, which doesn't happen in the case of acid flux
 (e) of presence of high content of oxygen.
59. The reduction of iron ore in the blast furnace mainly takes place by
 (a) coke (b) carbon-monoxide
 (c) carbondioxide (d) hydrogen
 (e) nitrogen.*
60. If ϵ_1 and ϵ_2 are the maximum and minimum principal strains, E the modulus of elasticity, then the maximum principal stress σ_1 is equal to
 (a) $\frac{E}{1-\mu^2} [\epsilon_1 + \mu\epsilon_2]$
 (b) $\frac{E}{1-\mu^2} [\epsilon_1 - \mu\epsilon_2]$
 (c) $\frac{E}{1+\mu^2} [\epsilon_1 + \mu\epsilon_2]$
 (d) $\frac{E}{1-\mu^2} [\mu\epsilon_1 + \epsilon_2]$
 (e) $\frac{E}{1-\mu^2} [\epsilon_2 - \mu\epsilon_1]$.
61. If a beam with the rectangular cross-section is obtained by cutting from circular log of timber, then for the beam to have strongest section in bending, the ratio of breadth to depth should be
 (a) 0.717 (b) 0.807
 (c) 0.707 (d) 0.500
 (e) 0.786.
62. If E_s and E_t are the modulus of elasticity of steel then the width of equivalent timber beam for a steel beam of width t is
 (a) $\frac{E_s}{E_t} t$ (b) $\frac{E_t}{E_s} t$
 (c) $t \left(1 - \frac{E_s}{E_t} \right)$ (d) $t \left(1 - \frac{E_t}{E_s} \right)$
 (e) $t \left(1 + \frac{E_s}{E_t} \right)$.
63. For a rectangular section the maximum shear stress due to bending is
 (a) 1.2 times the average shear stress
 (b) 1.5 times the average shear stress
 (c) 2.0 times the average shear stress
 (d) 2.5 times the average shear stress
 (e) 3 times the average shear stress.
64. For a solid circular cross-section the maximum shear stress due to bending is
 (a) 3 times the average shear stress
 (b) 2.5 times the average shear stress
 (c) 2 times the average shear stress
 (d) 1.5 times the average shear stress
 (e) 1.33 times the average shear stress.
65. A prismatic beam has
 (a) uniform depth (b) uniform width
 (c) uniform cross-section
 (d) uniform strength
 (e) uniform shear stress.
66. In the case of pure bending, the beam will bend into an arc of a
 (a) parabola (b) ellipse
 (c) circle (d) hyperbola
 (e) straight line.
67. If a hole of diameter equal to plate thickness is to be punched, then the ratio of maximum crushing stress of a punch to the maximum shearing stress of the plate is
 (a) half (b) one
 (c) two (d) three
 (e) four.

68. If J is polar moment of inertia in a shaft of radius R and s_s is shear stress then torque T is equal to
- (a) $\frac{s_s R}{J}$ (b) $\frac{JR}{s_s}$
 (c) $\frac{s_s J}{R}$ (d) $\frac{R}{s_s J}$
 (e) $\frac{J}{s_s R}$
69. In the case of I-sections, the web portion resists mainly
- (a) bending moment
 (b) axial force
 (c) shear force
 (d) shear force and bending moment
 (e) axial force and bending moment.
70. If s_s is the shear stress and N is the modulus of rigidity then the strain energy per unit volume for a solid shaft of diameter d is
- (a) $\frac{s_s^2}{2N}$ (b) $\frac{s_s^2}{3N}$
 (c) $\frac{s_s^2}{4N}$ (d) $\frac{s_s^2}{4Nd}$
 (e) $\frac{ds_s^2}{4N}$
71. In the case of triangular section dam of height H and base B , S is the specific gravity of masonry. The minimum bottom width to avoid tension should be
- (a) $\frac{H}{3\sqrt{S}}$ (b) $\frac{H}{3S}$
 (c) $\frac{H}{\sqrt{S}}$ (d) $\frac{H}{S^{3/2}}$
 (e) $\frac{2H}{\sqrt{S}}$
72. If the modulus of elasticity is equal to zero, the material is said to be
- (a) rigid (b) plastic
 (c) flexible (d) plastic
 (e) malleable.
73. Materials which fracture when the strains are small are known as
- (a) brittle (b) ductile
 (c) rigid (d) plastic
 (e) flexible.
74. Materials which have an appreciable deformation before failure are said to be
- (a) plastic (b) brittle
 (c) rigid (d) ductile
 (e) tough.
75. If a circular shaft of diameter d having polar moment of inertia J , is subjected to torque T , then total strain energy due to torsion is
- (a) $\int \frac{T^2 d}{2GJ}$ (b) $\int \frac{T^2 d}{2G}$
 (c) $\int \frac{T^2 d}{GJ}$ (d) $\int \frac{2T^2 d}{GJ}$
 (e) $\frac{T^2 d}{3GJ}$
- where G is the rigidity modulus.
76. Pick up the wrong statement
- (a) The atoms in a metal crystal are arranged in a regular, repeated three-dimensional pattern
 (b) Most of the individual atoms may be considered as tiny spheres, with diameters of the order of 10^{-8} centimeter
 (c) At the transition temperature, the crystal structure of polymorphic metals changes
 (d) At the transition temperature, change in volume doesn't take place, because chemical properties of metal do not change
 (e) Copper, silver and gold have F.C.C. structure.
77. Pick up the wrong statement
- (a) Being different polymorphic forms of same metal, alpha-iron and gamma-iron have same crystal structure
 (b) There are four atoms per unit cell in the face centred cubic structure
 (c) A pure metal solidifies from the liquid state at a constant temperature
 (d) The melting point of an alloy is lower than that of its constituent metals
 (e) In steel, carbon is present in both elemental and combined form.
78. Which is the softest out of the following
- (a) ferrite (b) austenite
 (c) cementite (d) pearlite
 (e) bainite.
79. Pick up the wrong statement
- (a) The typical example of an age-hardening alloy is duralumin
 (b) The age-hardening phenomenon is not observed in ferrous alloys

- (c) Natural ageing takes place at room temperature
 (d) During age-hardening of duralumin alloys, CuAl_2 compound is formed
 (e) In precipitation hardening, the particles precipitate from super-saturated solution of the compound.
80. An ideal coolant for a nuclear reactor should
 (a) be a good absorber of neutrons
 (b) be capable of attaining high temperature only when it is pressurised
 (d) be free from radiation damage and non-corrosive
 (e) a poor absorber of neutrons.
81. Compared to CO_2 , He, N_2 etc., water is a better coolant because it
 (a) is a better neutron moderator as well
 (b) requires comparatively smaller pumps and heat exchanger for a given heat transfer rate
 (c) has a better heat transfer characteristics and it can be pressurised to attain a high temperature
 (d) all of the above (e) none of the above.
82. Which of the following may not need a control rod ?
 (a) liquid metal cooled reactor
 (b) fast breeder reactor
 (c) candu reactor
 (d) research reactor
 (e) none of the above.
83. Heavy water is preferred over ordinary water as a coolant because it
 (a) acts both as an efficient coolant as well as a moderator
 (b) can be heated to a higher temperature without pressurising
 (c) is less prone to radiation damage
 (d) all of the above
 (e) none of the above.
84. Spent fuel from the nuclear thermal reactor contains
 (a) fission products (b) plutonium
 (c) unused fuel (d) all of the above
 (e) none of the above.
85. Commercial power generation from fusion reactor is not yet possible because
 (a) it is difficult to control fusion reaction
 (b) the fuel required (e.g. deuterium and tritium) is scarce
 (c) it is difficult to initiate fusion reaction
 (d) quantity of fuel required for initiating fusion reaction is prohibitively high
 (e) it is difficult to contain the nuclear hazards.
86. Blast furnace stack is lined with the following bricks :
 (a) silica (b) chrome magnesite
 (c) fireclay (d) calcined dolomite
 (e) graphite.
87. Wavelength corresponding to the maximum energy is inversely proportional to the absolute temperature. This is
 (a) Stefan's law (b) Dalton's law
 (c) Wien's law (d) Kirchhoff's law
 (e) Prandtl's law.
88. Weld decay is a phenomenon associated with
 (a) non-ferrous materials
 (b) mild steel (c) cast iron
 (d) high carbon steel
 (e) stainless steel.
89. Pick out the wrong statement about difference in SI and CI engines
 (a) SI engines are based on otto cycle and CI engines are based on diesel cycle
 (b) In SI engines, fuel and air are introduced into the combustion chamber but in CI engines the fuel is introduced at the end by fuel injection nozzle
 (c) SI engines require an ignition system but in CI engines, high temperature and pressure initiate combustion
 (d) compression ratio of SI engines is of the order of 5 to 10 and that of CI engines is of the order of 12 to 20
 (e) SI engines are heavier than CI engines.
90. Loss of heat from unlagged steam pipe to the ambient air is by
 (a) conduction (b) convection
 (c) radiation
 (d) convection and radiation
 (e) conduction, convection and radiation.
91. Fourier's law of heat transfer applies to
 (a) convection
 (b) radiation (c) conduction
 (d) all of the above (e) none of the above.
92. For the same compression ratio,

- (a) Diesel cycle is more efficient than otto cycle
 (b) Otto cycle is more efficient than diesel cycle
 (c) Both otto and diesel cycles are equally efficient
 (d) which is more efficient depends on other factor and design of engine also
 (e) unpredictable.
93. For the same compression ratio, the thermal efficiencies of Otto, Diesel and Dual combustion cycle will be in the following order
 (a) Otto, dual, diesel
 (b) Otto, diesel, dual
 (c) Dual, otto, diesel
 (d) Dual, diesel, otto
 (e) Diesel, otto, dual.
94. High phosphorus in steel induces
 (a) cold-shortness (b) hot-shortness
 (c) blowholes (d) strain ageing
 (e) brittleness.
95. Grindability of a mineral doesn't depend upon
 (a) colour (b) toughness
 (c) cleavage (d) hardness
 (e) modulus of elasticity.
96. The overall resistance, for heat transfer through a series of flat resistances, is the
 (a) average of the resistances
 (b) geometric mean of the resistances
 (c) product of the resistances
 (d) sum of the resistances
 (e) inverse sum of all resistances, inversed.
97. Which area is used in case of heat flow by conduction through cylinder ?
 (a) logarithmic mean area
 (b) arithmetic mean area
 (c) geometric mean (d) inner area
 (e) outer area.
98. Aluminium is added in the ladle as
 (a) deoxidiser (b) grain refiner
 (c) deoxidiser and grain refiner both
 (d) flux (e) alloying element.
99. Pick out the wrong statement
 (a) Cracks in the ingots develop mostly with high teeming temperature and speeds
 (b) for teeming purposes, hot stopper is fitted in a preheated ladle
 (c) Deoxidation products are soluble in steel bath
 (d) In rimmed steels, minimum deoxidation has taken place
 (e) In casting of killed steel ingots, practically there is no evolution of gas.
100. On mixing up of warm and cold liquids the heat transfer is mainly by
 (a) conduction (b) convection
 (c) radiation
 (d) both conduction and radiation
 (e) both convection and radiation.
101. LMTD can't be used as such without a correction factor for
 (a) multipass heat exchangers
 (b) baffled heat exchanger
 (c) the condensation of mixed vapour in a condenser
 (d) all of the above
 (e) none of the above.
102. Pick up the wrong statement
 (a) Diesel oil is rated by its octone number
 (b) Natural gas may be found above the strata of liquid fuel under soils
 (c) Blue gas is the other name of water gas
 (d) Producer gas can be obtained by partial combustion of any carbonaceous fuel
 (e) Water gas is produced by the interaction of hot coke with steam.
103. During storage, following fuel is liable to spontaneous ignition
 (a) producer gas (b) gasoline
 (c) diesel oil (d) coal
 (e) wood.
104. The roofs of both acid basic open hearth furnaces may be made of
 (a) silica (b) dolomite
 (c) chromite (c) graphite
 (e) fireclay.
105. Pick up the wrong statement
 (a) Neutral refractory is neither suitable for acid nor for basic furnace, therefore, its use for furnace lining is limited
 (b) Basic refractories are commonly used for basic furnaces
 (c) Acid refractories are those, which are not attacked by acid slags
 (d) Silicon carbide and graphite are neutral refractories
 (e) Silica is a naturally occurring refractory material.

106. Which of the following coal has the highest calorific value ?
 (a) Lignite (b) Sub-bituminous
 (c) Anthracite (d) Peat
 (e) Bituminous.
107. The main product of high temperature carbonisation is
 (a) Coke (b) Ammonia
 (c) Tar (d) Phenol
 (e) Blue gas.
108. A good quality coal should have
 (a) low fusion point of ash
 (b) high ash content
 (c) high sulphur content
 (d) high grindability index
 (e) none of the above.
109. With increase in temperature of a material, its
 (a) strength and ductility increase
 (b) strength and ductility decrease
 (c) strength decreases but ductility increases
 (d) strength increases but ductility decreases
 (e) none of the above.
110. If the strength of a particular grade of steel is high
 (a) its hardness and hardenability will be also high
 (b) its hardness will be low but hardenability will be high
 (c) its hardness will be high, but hardenability will be low
 (d) scratch hardness and hardenability both will be low
 (e) none of the above.
111. The unit of Brinell hardness number is
 (a) kilogram-millimetre
 (b) kilogram per millimetre
 (c) kilogram-millimetre square
 (d) kilogram per square millimetre
 (e) a dimensionless quantity.
112. Soft magnetic materials have
 (a) low hysteresis and low eddy current
 (b) high hysteresis and high eddy current
 (c) low hysteresis and high eddy current
 (d) high hysteresis and low eddy current
 (e) none of the above is correct.
113. If the temperature of an intrinsic semi-conductor is raised to sufficiently high value, it may behave as
 (a) conductor (b) insulator
 (c) semi-conductor (d) super-conductor
 (e) unchanged.
114. Pick up the wrong statement
 (a) Aluminium may be used as a reducing agent in the production of vanadium
 (b) Aluminium is used as deoxidising agent in steel bath
 (c) Iron has great affinity for oxygen than copper
 (d) Iron has great affinity for sulphur than copper
 (e) The percentage of copper in copper blister is around 99.5%.
115. The percentage of iron in pig iron is
 (a) 85% (b) 90%
 (c) 92.5% (d) 95%
 (e) 97%.
116. Pick out the wrong statement
 (a) Pure iron melts at about 1539°C
 (b) Pure iron is softer than pig iron or malleable iron
 (c) Pure iron doesn't corrode easily in moist atmosphere
 (d) Sponge iron contains little amount slag
 (e) The iron obtained from blast furnace is called pig iron.
117. Permanent set in a material is produced by
 (a) subjecting it to fatigue loading
 (b) subjecting it to high temperature
 (c) triaxial loading
 (d) stressing it beyond the elastic limit
 (e) applying compressive and tensile loads simultaneously.
118. Toughness is that property of a material which enables it to absorb energy at high stress without fracture, usually above the elastic limit. Which of the following material has high toughness
 (a) cast iron (b) wrought iron
 (c) carbon steel (d) stainless steel
 (e) aluminium alloys.
119. Electrolytic reduction of alumina is done by
 (a) Pattinson's process
 (b) Bayer's process
 (c) Hall and Heroult process
 (d) Hoop's process
 (e) Duplex process.

120. Presence of manganese in alloy steel improves its
 (a) corrosion resistance
 (b) cutting ability
 (c) abrasion resistance and toughness
 (d) elasticity and creep resistance
 (e) creep and fatigue properties.
121. The disappearing filament type optical pyrometer is based on the principle of
 (a) Thompson effect
 (b) Seebeck effect
 (c) Stefan's Boltzmann law
 (d) Wien's law
 (e) Peltier effect.
122. The suitable case hardening process for alloy steels containing chromium, molybdenum is
 (a) induction hardening
 (b) resistance hardening
 (c) carburising
 (d) nitriding
 (e) cyaniding.
123. The suitable case hardening process for plain carbon steel, containing 0.2 per cent carbon, is
 (a) carburising (b) nitriding
 (c) cyaniding (d) carbo-nitriding
 (e) induction hardening.
124. A product having complex internal cavities is cast by inserting following into a mold of the casting
 (a) patterns (b) cores
 (c) chills (d) chaplets
 (e) core prints.
125. The collapsibility property of core is provided by
 (a) fine grain sands (b) inorganic binder
 (c) organic binder (d) molasses
 (e) linseed oil.
126. The defect caused in casting due to hard core, which restricts the casting during solidification, is called
 (a) fins (b) hot tears
 (c) scabs (d) fissures
 (e) misrun.
127. In gating system, skim bobs or relief sprues are provided mainly to
 (a) minimise the erosion of downsprue
 (b) permit gases to escape
 (c) avoid shifting of core
 (d) collected dross or slag present in metal
 (e) permit high pouring rate of metal.
128. By Duplex process of steel making, generally we mean the following processes
 (a) acid bessemer and acid open hearth
 (b) basic bessemer and basic open hearth
 (c) acid bessemer and basic open hearth
 (d) basic bessemer and acid hearth
 (e) basic open hearth and electric arc.
129. The purpose of oxygen in the open-hearth process is
 (a) to decrease the temperature, to favour dephosphorisation
 (b) to increase the temperature of bath and thereby increasing the efficiency of operation
 (c) to decrease the nitrogen content of steel
 (d) to control the temperature of the bath to minimum working condition
 (e) to clean the steel.
130. Creep is that property which causes some materials under constant stress to deform slowly but progressively over a period of time. Creep in steels becomes important at temperatures above
 (a) room temperature
 (b) 100°C (c) 150°C
 (d) 200°C (e) 300°C.
131. Dislocation falls under the following category of defect
 (a) point (b) line
 (c) surface (d) grain boundary
 (e) crystalline.
132. Pick up the wrong statement
 (a) The number of vacant lattice sites in a metal increases rapidly with increase in temperature
 (b) In screw dislocation, the dislocation line is parallel to burger's vector
 (c) In the precipitation hardening, the precipitated particles resist the dislocation motion
 (d) In the cross-slip the slip plane changes by a moving screw dislocation
 (e) The slip plane of edge dislocation is parallel to the dislocation but perpendicular to the burger's vector.
133. Patenting is a process of
 (a) refining of lead

- (b) extraction of copper from its ore
 (c) heat treatment applied to medium and high-carbon steels in wire drawing
 (d) increasing strength of materials
 (e) improving surface finish.
134. Which of the following is used as the wire for a heating element
 (a) invar (b) nichrome
 (c) stainless steel (d) gun metal
 (e) constantan.
135. If 100 kJ of heat is added to 1 kg of water, its temperature rises by 24°C. If same heat is added of 1 kg copper, its temperature will rise by
 (a) 24°C (b) 68°C
 (c) 112°C (d) 200°C
 (e) 263°C.
136. If t_1 and t_2 be surface temperature of the body and ambient temperature, then the heat loss by the body by natural convection is proportional to its area and
 (a) $t_1 - t_2$ (b) $(t_1 - t_2)^{1.25}$
 (c) $(t_1 - t_2)^2$ (d) $(t_1 - t_2)^3$
 (e) $(t_1 - t_2)^4$.
137. If t_1 and t_2 be temperature of incoming and outgoing air, then heat transferred by forced convection is proportional to the volume flow of cooling air and
 (a) $(t_2 - t_1)$ (b) $(t_2 - t_1)^{1.25}$
 (c) $(t_2 - t_1)^{1.5}$ (d) $(t_2 - t_1)^2$
 (e) $(t_2 - t_1)^4$.
138. In shell moulding, following type of sand is used
 (a) clay bonded silica sand
 (b) cement bonded sand
 (c) thermo-setting resin and fine sand
 (d) gypsum and silica sand
 (e) urea furfural resin and fine sand.
139. In lost wax process, wax is used for making
 (a) mould (b) pattern
 (c) sprue
 (d) as coating material
 (e) core.
140. Moulding sand must possess the following property to resist erosion and withstand metallostatic pressure of molten metal
 (a) dry strength (b) green strength
 (c) thermal stability (b) refractoriness
 (e) permeability.
141. In order to reduce tendency of formation of blowholes in a casting, mould must have adequate
 (a) green compressive strength
 (b) permeability
 (c) dry strength and green strength
 (d) refractoriness
 (e) hot strength and thermal stability.
142. Bentonite is generally used in moulding sand to provide
 (a) high refractoriness of the mould
 (b) improved hot strength of the mould
 (c) strength and plasticity of the moulding sand
 (d) edge hardness of the mould
 (e) permeability of the mould.
143. Pick out the wrong statement
 (a) In steel making, various impurities are oxidised
 (b) In Bessemer practice of steel making, pig iron is charged in molten stage
 (c) In acid bessemer process, carbon, sulphur and manganese can be reduced as per requirement, because oxidation rate is very high
 (d) In the conventional Bessemer process, air is blown from bottom
 (e) Bessemer converter is made of ductile iron shell.
144. If failures in system are due to chance alone, then relationship between reliability and system failure rate is
 (a) linear (b) exponential
 (c) hyperbolic (d) parabolic
 (e) logarithmic.
145. The variation of failure rate with time for most of the equipments/systems follows
 (a) linear curve
 (b) exponential curve
 (c) bath tub curve
 (d) inverted bath tub curve
 (e) logarithmic curve.
146. Molasses are used to improve
 (a) dry strength of sand and edge hardness of moulds
 (b) collapsibility and flowability of sands
 (c) casting finish

- (d) green strength and collapsibility of sand
(e) hot strength and refractoriness.
147. In carbon dioxide process of moulding, the mould is hardened due to the formation of
(a) sodium carbonate
(b) silica gel
(c) complex compound having thio-sulphate radical
(d) a product obtained after reaction of sodium silicate, bentonite and carbon-dioxide
(e) hardened sand.
148. The thermal neutrons used for fission of U-235 have velocity of around
(a) 10 m/sec (b) 200 m/sec
(c) 2200 m/sec (d) 2.2×10^4 m/sec
(e) 2.2×10^{11} m/sec.
149. A fertile material is one which can be
(a) converted into fissile material on absorption of neutrons
(b) fissioned by slow (thermal) neutrons
(c) fissioned by fast neutrons
(d) fissioned by either slow or fast neutrons
(e) converted into fissile material by emission of neutrons.
150. Thermal shield in high powered nuclear reactors is used to
(a) protect the walls of the reactor from radiation damage
(b) absorb the fast neutrons
(c) slow down the secondary neutrons
(d) protect the fuel element from coming in contact with the coolant
(e) absorb the slow neutrons.
151. Enriched uranium means that it contains
(a) more than 0.71% of U-235
(b) 100% U-235
(c) only fertile material
(d) only fissile material
(e) both fertile and fissile materials.
152. Candu reactor is
(a) a natural uranium fuelled and heavy water cooled and moderated reactor
(b) designed to operate with highly enriched uranium (85% U-235)
(c) a homogeneous reactor
(d) a fast breeder reactor
(e) a research reactor.
153. In a pressurised water reactor (PWR)
(a) the fuel in natural uranium and heavy water acts both as moderator and coolant
(b) the coolant water boils in the core of the reactor
(c) the coolant water is pressurised to prevent bulk boiling of water in the core
(d) no moderator is used
(e) the coolant water is pressurised to act as moderator.
154. A boiling water reactor in one in which the
(a) coolant water is allowed to boil in the core of the reactor
(b) coolant water, after being heated in the reactor core generates steam in a boiler
(c) boiling water is pumped into the core
(d) fuel and coolant are thoroughly mixed to form a homogeneous solution
(e) boiling water acts as moderator.
155. Liquid metal (e.g. molten sodium) is preferred as a coolant in the use of
(a) a homogeneous reactor
(b) a graphite moderated reactor
(c) a fast breeder reactor
(d) an enriched uranium (3% U-235) fuelled reactor
(e) a slow breeder reactor.
156. Hastelloy comprises
(a) copper and nickel
(b) copper and aluminium
(c) molybdenum and nickel
(d) lead and tin
(e) molybdenum and copper.
157. A particular coal is said to be free burning when it
(a) burns completely
(b) gives smokeless burning
(c) shows little or no fusing action
(d) can be ignited without auxiliary energy
(e) leaves no unburnt carbon.
158. Grindability index of a coal is 100. It implies that the
(a) coal can be pulverised with great difficulty
(b) coal can't be pulverised
(c) coal can be easily pulverised
(d) power consumption in grinding the coal will be very high
(e) none of the above.

159. A coal containing high amount of volatile matter will have
 (a) low ignition temperature
 (b) very little ash content
 (c) high fusion point of its ash
 (d) low adiabatic flame temperature
 (e) high ignition temperature.
160. Spontaneous combustion of coal on storage results due to
 (a) inadequate ventilation
 (b) low temperature oxidation
 (c) storage in large heaps with small surface to volume ratio
 (d) all of the above
 (e) none of the above.
161. Fixed carbon in coal is defined as
 (a) that present in volatile matters
 (b) the total quantity of carbon present in the coal
 (c) hundred minus the percentage of volatile matter, ash and moisture
 (d) the one which is present in the residue after combustion
 (e) none of the above.
162. Anthracite coal
 (a) contains more volatile matter than bituminous coal
 (b) ignites more easily than bituminous coal
 (c) is essentially a coking coal
 (d) burns with short, bluish, yellow-tipped flame producing very little smoke
 (e) can be used for gasification and steam generation.
163. Which of the following would ignite most easily?
 (a) a coal with high fixed carbon content
 (b) a coal with high volatile matter content
 (c) a coal with high ash content
 (d) a coal with high oxygen content
 (e) a coal with high hydrogen content.
164. Plastic tubes and pipes are generally made by
 (a) injection moulding
 (b) extrusion moulding
 (c) transfer moulding
 (d) compression moulding
 (e) all of the above.
165. Slag inclusion in castings is a
 (a) superficial defect
 (b) internal defect
 (c) moulding defect
 (d) defect that can be removed by fettling
 (e) surface defect.
166. Swell is a defect in castings due to
 (a) mis-matching of mould at the parting line
 (b) loose ramming of sand
 (c) enlargement of the mould cavity by metal pressure causing partial or overall enlargement of the casting
 (d) thin projection of casting due to gap between flasks
 (e) moisture in moulding sand.
167. A core is employed in moulding to
 (a) produce chilled surface
 (b) produce sound casting
 (c) provide desired recesses in casting
 (d) enable easy removal of pattern
 (e) permit uniform flow of metal during moulding.
168. Gold ornaments are generally produced by following casting method
 (a) die casting (b) investment casting
 (c) centrifugal casting
 (d) slush casting
 (e) pressed casting.
169. Tumbling is employed to
 (a) Clean the surface of small parts
 (b) Stress relieve the components
 (c) impart surface finish
 (d) electroplate the surface
 (e) blasting the surface with sand.
170. The best process for the mass manufacturing of steel balls is
 (a) turning on a lathe
 (b) turning on a capstan or Turret Lathe
 (c) turning on an automatic lathe
 (d) cold heading
 (e) casting.
171. A tool used for removing broken bolts and studs from a hole is known as
 (a) Screw driver (b) Punch
 (c) Ezy-out (d) Telescopic rod
 (e) Emry rod.
172. Coolant used while turning cast iron is
 (a) Lard oil (b) Soluble oil
 (c) Kerosene (d) Soda water
 (e) None of the above.

173. Which of the following operations is known as 'sweating'
- (a) tinning the two surfaces to be joined, applying flux and heating
 - (b) heating two surfaces to be joined to a high temperature in presence of flux
 - (c) heating two surfaces at low temperature
 - (d) joining of two surfaces without use of flux
 - (e) welding by heating and hammering.
174. Weld spatter defect in welding is generally the result of
- (a) using too high welding current
 - (b) using too low welding current
 - (c) low voltage
 - (d) high voltage
 - (e) using wrong polarity.
175. Poor fusion in a welded joint may be due to
- (a) lack of flux (b) improper current
 - (c) high welding speed
 - (d) dirty metal surface
 - (e) oxidising atmosphere.
176. Drop in castings occurs due to :
- (a) low green strength, low mould-hardness, insufficient reinforcement of sand projections
 - (b) too fine a sand
 - (c) sand having low permeability
 - (d) uneven mold ramming
 - (e) soft ramming.
177. Sand with high moisture content results in :
- (a) scab (b) drop
 - (c) fins (d) hot tears
 - (e) cold shut.
178. Pin holes in casting occur because of :
- (a) sand with higher moisture content
 - (b) faulty metal
 - (c) metal mold reaction
 - (d) all of the above
 - (e) none of the above.
179. Cold shut defect in casting develops because of :
- (a) too cold molten metal
 - (b) too small gates
 - (c) too thin casting section
 - (d) all of the above
 - (e) none of the above.
180. The core is a part of mold in case of :
- (a) green sand (b) dry sand
 - (c) loam sand (d) backing sand
 - (e) parting sand.

Model Test Paper-4

Attempt all the questions. Each question carries equal marks.
Time allowed for each question on an average is 20 seconds.

- Which of the following is not the feature of the SI system
 - It is a decimal system
 - It employs many units commonly used in industry and commerce
 - It is a coherent system that expresses with startling simplicity some of the most basic relationships which occur in electricity, mechanics and electro mechanics
 - It is a metric system
 - It can be used by the research scientist, the technician, the practicing engineer, the by the layman, thereby blending the theoretical and practical world.
- The SI system uses following number of base and supplementary units
 - 5,2
 - 6,2
 - 7,2
 - 8,2
 - 9,3.
- The unit of amount of substance in SI units is
 - kg
 - gm
 - mole
 - steradian
 - atomic mass.
- According to SI units, force with unit as newton is the
 - base unit
 - supplementary unit
 - extra unit
 - derived unit
 - common unit.
- Cohesion is defined as the inter-molecular attraction between molecules of
 - same liquid
 - different liquids
 - a liquid and the solid boundary surface in contact
 - any two liquids
 - two solids.
- Piezometer is used to measure
 - pressure difference between any two points
 - pressure difference across orifice plate
 - velocity head
 - pressure at a point
 - flow at a point.
- Poise is converted into stoke by
 - multiplying with density (gm/c.c.)
 - dividing with density (gm/c.c.)
 - multiplying with specific gravity
 - dividing with specific gravity
 - multiplying with specific gravity and dividing with density.
- For a fluid rotating at constant angular velocity about vertical axis as a rigid body, the pressure intensity varies as the
 - square of the radial distance
 - radial distance linearly
 - inverse of the radial distance
 - elevation along vertical direction
 - inverse of square of radial distance.
- Rotameter is used for measuring
 - discharge through pipes
 - discharge through open channels
 - velocity of flow
 - rotation of flow
 - kinetic energy of flow.
- Find the odd man out
 - orifice meter
 - current meter
 - nozzle meter
 - venturi meter
 - rotameter.
- Pitot tube is used for measuring
 - discharge through weirs
 - discharge through orifices
 - velocity of flow
 - discharge in pipes
 - discharge in open channel.

12. Foot valves are provided in the suction line of a centrifugal pump to
- avoid priming every time we start the pump
 - remove the contaminant present in the liquid
 - minimise the fluctuation in discharge
 - control the liquid discharge
 - avoid cavitation.
13. Capacity of a rotary gear pump can be varied by
- changing the speed of rotation
 - bleeding air into suction
 - bypassing liquid from the suction or discharge line
 - all of the above
 - none of the above.
14. At a constant speed of the centrifugal pump
- capacity varies directly with the impeller diameter
 - head varies as the square of the impeller diameter
 - horsepower varies as the cube of the impeller diameter
 - all of the above
 - none of the above.
15. Pump used for transportation of molten sodium in fast breeder reactor is
- reciprocating pump
 - plunger pump
 - electro magnetic pump
 - gear pump
 - diaphragm pump.
16. The head developed by a centrifugal pump is largely determined by the
- power of the pump
 - nature of the liquid being pumped
 - angle of the vanes and the speed of the tip of the impeller
 - vapour pressure of the liquid
 - suction life and pipe friction losses.
17. A whirlpool in a river is an example of
- a free vortex
 - a forced vortex
 - a spiral forced vortex
 - a cylindrical forced vortex
 - irrotational flow.
18. If C_v , C_c and C_d are the coefficient of velocity, coefficient of contraction, and coefficient of discharge of an orifice, then C_c is equal to
- $\frac{C_d}{C_v}$
 - $C_d C_v$
 - $\frac{C_v}{C_d}$
 - $\frac{1}{C_v C_d}$
 - $1 - \frac{C_d}{C_v}$
19. Cavitation occurs in a centrifugal pump when the suction pressure is
- less than vapour pressure of the liquid at that temperature
 - more than vapour pressure of the liquid at that temperature
 - equal to vapour pressure of the liquid at that temperature
 - equal to developed head
 - more than the developed head.
20. Priming is needed in a
- reciprocating pump
 - gear pump
 - centrifugal pump
 - diaphragm pump
 - all of the above.
21. The maximum depth from which a centrifugal pump can draw water is
- dependent on the speed N of the pump
 - dependent on the power of the pump
 - dependent on the flow
 - dependent on N^2
 - around 10 m.
22. Delivery of insufficient quantity of liquid by a pump may be caused by
- air leak in the inlet
 - low rpm
 - too high a lift
 - all of the above
 - cavitation.
23. Nominal pipe size at discharge of a pump compared to nominal size of the inlet pipe is usually
- smaller
 - large
 - same
 - twice
 - may be smaller or large depending on the flow.
24. In turbulent flow
- the fluid particles move in an orderly manner
 - momentum transfer is on molecular scale only

- (c) shear stress is caused more effectively by cohesion than momentum transfer
 (d) shear stresses are generally larger than in a similar laminar flow
 (e) shear stresses are generally less than in a similar laminar flow.
25. Bernoulli's equation describes
 (a) mechanical energy balance in potential flow
 (b) kinetic energy balance in laminar flow
 (c) mechanical energy balance in turbulent flow
 (d) mechanical energy balance in boundary layer
 (e) kinetic energy balance in turbulent flow.
26. If the discharge of a centrifugal pump is throttled then its suction lift
 (a) increases (b) decreases
 (c) remains unchanged
 (d) first increases and then decreases
 (e) first decreases and then increases.
27. The greatest stress applied infinite number of times that a material can take without causing failure is known as
 (a) elastic limit
 (b) proportionality limit
 (c) endurance limit
 (d) fatigue limit
 (e) creep limit.
28. Principal planes are planes of
 (a) maximum shearing stress
 (b) zero shearing stress
 (c) shearing stress having a magnitude of 50% of principal stress
 (d) zero principal stress
 (e) minimum shearing stress.
29. A direct stress induces a shear stress of half its intensity on a plane inclined at
 (a) 30° to the plane carrying direct stress
 (b) 90° to the plane carrying direct stress
 (c) 60° to the plane carrying direct stress
 (d) 45° to the plane carrying direct stress
 (e) $22\frac{1}{2}^\circ$ to the plane carrying direct stress.
30. In a delta rosette, the strain gauges are oriented at
 (a) 0° , 45° and 90°
 (b) 0° , 90° and 180°
 (c) 0° , 60° and 120°
 (d) 0° , 30° and 120°
 (e) 0° , 60° and 90° .
31. If ϵ_x , ϵ_y and ϵ_{xy} are the strains along x direction, y direction and shear strain respectively then the maximum principal strain ϵ_{max} is equal to
 (a) $\frac{\epsilon_x + \epsilon_y}{2} + \sqrt{\left(\frac{\epsilon_x - \epsilon_y}{2}\right)^2 + \frac{v_{xy}^2}{4}}$
 (b) $\frac{\epsilon_x + \epsilon_y}{2} + \sqrt{\left(\frac{\epsilon_x - \epsilon_y}{2}\right)^2 + \frac{v_{xy}^2}{2}}$
 (c) $\frac{\epsilon_x - \epsilon_y}{2} - \sqrt{\left(\frac{\epsilon_x - \epsilon_y}{2}\right)^2 + \frac{v_{xy}^2}{4}}$
 (d) $\frac{\epsilon_x^2 + \epsilon_y}{2} - \sqrt{\left(\frac{\epsilon_x - \epsilon_y}{2}\right)^2 + \frac{v_{xy}^2}{2}}$
 (e) $\frac{\epsilon_x + \epsilon_y}{2} + \sqrt{\left(\frac{\epsilon_x - \epsilon_y}{2}\right)^2 + \frac{v_{xy}^2}{4}}$
32. In the case of a cantilever beam of length L carrying a moment M at the free end, the maximum slope will be equal to
 (a) $\frac{ML^2}{EI}$ (b) $\frac{ML}{3EI}$
 (c) $\frac{2ML}{EI}$ (d) $\frac{ML}{EI}$
 (e) $\frac{MI}{2EI}$
33. The unit of flexural rigidity is
 (a) kg cm (b) kg/cm
 (c) kg cm^2 (d) kg/cm^2
 (e) kg cm^3
34. Charpy test is
 (a) a bending test (b) an impact test
 (c) a fatigue test (d) a hardness test
 (e) an endurance test.
35. Slenderness ratio of a column is defined as the ratio of its length to its
 (a) least lateral dimension
 (b) least radius of gyration
 (c) maximum lateral dimension
 (d) maximum radius of gyration
 (e) area of cross-section.
36. Clapeyron's theorem is associated with the analysis of
 (a) continuous beams
 (b) cantilever beams
 (c) simply supported beams
 (d) thin cylinders

- (e) thick cylinders.
37. The wall thickness for a large high pressure pipeline is determined by consideration of
- axial tensile stresses in the pipe
 - forces exerted by static and dynamic action at bends
 - circumferential pipe wall tension
 - temperature stresses
 - creep life.
38. Heat is generated in a nuclear reactor (thermal) by
- reaction in a nuclear fuel *e.g.* uranium
 - fusion of atoms of uranium
 - absorption of U-235 by neutrons
 - fission of U-235 by neutrons
 - enriching of U-235 by neutrons.
39. Which of the following undergoes fission reaction easily ?
- U-235
 - U-238
 - Th-232
 - U-233
 - all of the above.
40. Thermal neutrons which are used to cause the fission of U-235 have energy
- < 0.025 eV
 - > 1 eV
 - > 25 eV
 - > 200 eV
 - < 1000 eV and > 500 eV.
41. Which reactor does not use a moderator ?
- candu reactor
 - fast breeder reactor
 - homogeneous reactor
 - pressurized water reactor
 - heterogeneous reactor.
42. A fast breeder reactor
- utilises fast neutrons for causing fission
 - converts fertile material (*e.g.* U-238) into fissile material (Pu-239)
 - normally employs molten sodium as coolant
 - converts thorium into U-233
 - all of the above.
43. Ordinary water is not used as a moderator because it
- has a low absorption cross-section
 - has a low scattering cross-section
 - absorbs neutrons
 - does not absorb neutrons
 - emits neutrons.
44. The main purpose of control rod in a nuclear reactor is to control the
- chain reaction and hence the power output by regulating the number of secondary neutrons causing fission
 - emission of hazardous radiation
 - conversion of fissile material into fertile material
 - velocity of the secondary neutrons
 - absorb neutrons.
45. Percentage of heavy water in ordinary water is around
- 0.015
 - 0.5
 - 0.71
 - 1.15
 - 2.5.
46. Heavy water (D_2O) in a nuclear reactor serves as
- coolant
 - moderator
 - both coolant as well as moderator
 - neutron absorber
 - shield.
47. Which of the following is a moderating material used in nuclear reactor ?
- graphite
 - cadmium
 - zircalloy (an alloy of zirconium and aluminium)
 - stainless steel
 - lead.
48. The function of moderators in nuclear reactor is to
- slow down the secondary neutrons
 - absorb the secondary neutrons
 - control the chain reaction
 - control heat
 - to act as shield.
49. "Critical mass" is the minimum mass of nuclear fissile material required for
- sustainment of chain reaction
 - power generation on commercial scale
 - economic power generation
 - starting nuclear reaction
 - avoiding any hazards.
50. Fast breeder reactors are best suited for India because
- of large thorium deposits
 - of large plutonium deposits
 - of large uranium deposits
 - it has no hazard
 - it uses water as coolant.
51. Maximum heat transfer rate is obtained in
- laminar flow
 - turbulent flow
 - uniform flow
 - critical region
 - straight flow.

52. Heat flux is time rate of heat transfer per unit
 (a) length (b) area
 (c) volume (d) angle
 (e) temperature.
53. Natural convection is characterised by
 (a) Grashhoff number
 (b) Peclet number (c) Reynolds number
 (d) Prandtl number (e) Nusselt number.
54. A unit mass of water at room temperature is heated and changed to superheated steam of 1 atm pressure and 250°C. The major heat consumption in the process will be to
 (a) heat the water from room temperature to 100°C
 (b) evaporate the water
 (c) to superheat the steam
 (d) equal in all the three stages
 (e) data insufficient to determine.
55. A temperature difference of 1 K is equal to the temperature difference of
 (a) 1°F (b) 1°C
 (c) 1°R (d) (273 + 1)°C
 (e) (273 - 1)°C.
56. SI unit 'siemens' stands for
 (a) resistivity (b) inductance
 (c) capacitance (d) conductance
 (e) magnetic field strength.
57. Air is best heated with steam in a heat exchanger of
 (a) plate type
 (b) double pipe type with fins on steam side
 (c) double pipe type with fins on air side
 (d) shell and tube type
 (e) equally in all of the above types.
58. Which of the following does not represent the important quality of SI engine fuel
 (a) anti-knock quality
 (b) volatility (c) sulphur content
 (d) viscosity (e) gum deposits.
59. Which of the following does not represent the important quality of CI engine fuel
 (a) ignition quality (b) volatility
 (c) viscosity (d) flash point
 (e) anti-knock quality.
60. An equipment which converts the latent or sensible heat of one fluid into the latent heat of vaporisation of another, is called a
 (a) boiler (b) heat exchanger
 (c) recuperator (d) regenerator
 (e) condenser.
61. The two-stroke cycle compression ignition engine inducts
 (a) air only
 (b) air and fuel mixture
 (c) air and lub oil
 (d) air, fuel and lub oil
 (e) air, fuel, lub oil and part of flue gases.
62. The two-stroke cycle spark ignition engines are not widely used. The reason for this is
 (a) high fuel consumption due to excessive loss of combustible mixture through escape with the exhaust gases
 (b) difficulty in design of combustion chamber and valves
 (c) high impulsive load on engine parts
 (d) high r.p.m.
 (e) quick heating up of cylinder due to frequent sparks and combustion.
63. Choose the most important factor on which the heat conducted through a wall in a unit time will depend on
 (a) thickness of the wall
 (b) area of the wall perpendicular to heat flow
 (c) material of the wall
 (d) temperature difference between the two surfaces of the wall
 (e) conductivity of the wall.
64. The specific gravity of coal depends mainly upon its
 (a) moisture content
 (b) volatile matter
 (c) type and ash content
 (d) fixed carbon content
 (e) C, H₂ and N₂ content.
65. In proximate analysis of coal, fixed carbon content may be calculated by deducting the following content from one hundred
 (a) hydrogen, nitrogen and oxygen
 (b) nitrogen, sulphur and volatile matter
 (c) moisture, ash and volatile matter
 (d) moisture and ash content
 (e) C, H₂ and N₂.
66. Bomb calorimeter is used to determine the following property of coal
 (a) moisture content
 (b) hydrogen content

- (c) specific gravity (d) calorific value
(e) specific heat.
67. Which of the following coals has the highest fixed carbon content
(a) anthracite (b) bituminous
(c) semi-bituminous (d) lignite
(e) charcoal.
68. Ash in fuels doesn't contain
(a) silica (b) lime
(c) coal tar (d) alumina
(e) ferric oxide.
69. Which is not true statement about metallurgical coke ?
(a) Its ash content should be as low as possible
(b) It should have low moisture, sulphur and phosphorus content
(c) It should be porous and soft for easy combustion
(d) It should be uniform in size
(e) It should have high calorific value, low ash content.
70. Pick up the wrong statement
(a) No gross deformation occurs at the fracture in fatigue failure of materials
(b) The limiting stress below which, the material can be subjected to an infinite number of cycles without failure is called endurance limit
(c) The fatigue limit of a specimen generally increases if its diameter is increased
(d) The fatigue strength of a specimen having smooth surface is higher than that having rough surface
(e) the fatigue strength of a steel specimen increases if it is carburised.
71. Which of the following has the highest fatigue strength
(a) aluminium alloys
(b) copper alloys (c) tin alloys
(d) mild steel (e) cast iron.
72. Permanent hardness of water is due to the presence of calcium and magnesium
(a) bi-carbonates
(b) sulphates and chlorides
(c) carbonates
(d) all of above
(e) none of above.
73. Dry ice (solidified CO_2) is used
(a) in the storage and shipment of frozen foods and icecreams
(b) for liquefaction of permanent gases
(c) for adsorption of hydrogen from coke oven gas
(d) air conditioning plant
(e) to produce commercial ice.
74. Higher viscosity index of a lubricating oil denotes
(a) less change in fluidity of oil with temperature
(b) substantially high change in fluidity of oil with temperature
(c) its unsuitability under varying temperature conditions
(d) its unsuitability in automobile
(e) its presence in the form of grease.
75. Which of the following has the poorest weldability ?
(a) low carbon steel (b) mild steel
(c) wrought iron (d) high-carbon steel
(e) alloys steel.
76. Which of the following stainless steels is non-magnetic ?
(a) ferritic (b) martensitic
(c) austenitic (d) all of above
(e) none of the above.
77. Pick up the wrong statement
(a) Like atoms of an element are held together by the sharing of electrons between them by covalent binding force
(b) A metal may be considered as a large number of positive ions immersed in a cloud of free electrons
(c) the melting point of alkali metal sodium is lower than that of barium because sodium has less number of valence electrons per atom available for bonding than barium
(d) The work done to remove one electron from a neutral atom, existing in most stable state, is called ionisation energy of that atom
(e) One mole of any substance, always contains the same number of molecules and that number is called quantum number.
78. Which of the following product can't be made by powder metallurgy technique ?
(a) sintered alumina powder
(b) carbide tools

- (c) copper-tungsten alloy
(d) high speed steel
(e) phenolic resin.
79. An important property in members where it is necessary to resist high stresses and high deformation which occur simultaneously is
(a) toughness (b) ductility
(c) resilience (d) stiffness
(e) elastic strength.
80. Presence of cobalt in steel improves its
(a) cutting ability (b) corrosion resistance
(c) tensile strength (d) creep properties
(e) fatigue properties.
81. Which of the following is the most suitable material of construction for evaporator and its tubes for concentrated NaOH solution to 70%?
(a) cast iron (b) steel
(c) nickel (d) mild steel
(e) aluminium.
82. Gun metal is an alloy of
(a) nickel, tin and copper
(b) copper, tin and zinc
(c) copper, phosphorus and nickel
(d) manganese, phosphorus and nickel
(e) copper, zinc and phosphorus.
83. In pack carburising, following compound is used as energizer
(a) sodium sulphate (b) hydrogen peroxide
(c) barium carbonate
(d) sodium phosphate
(e) sodium carbonate.
84. Which of the following parts need not be subjected to carburising treatment
(a) gears (b) cams
(c) piston gears (d) ingot
(e) gudgeon pin.
85. Pick up the wrong statement
(a) At constant stress, materials can continue to deform for an indefinite period
(b) The strain varies linearly with time in viscous creep
(c) The primary creep represents a region of decreasing creep rate
(d) During secondary creep, the rate of work hardening is approximately equal to that in recovery
(e) Creep rate decreases with the rise in temperature.
86. Which of the following processes is commonly used for hardening of gear tooth
(a) cold working (b) quenching
(c) dispersion hardening
(d) induction hardening
(e) forging.
87. Stabilisation of gasoline (petrol) means
(a) removal of dissolved gases from it
(b) increasing its oxidation stability
(c) stabilising its lead susceptibility
(d) increasing its vapour pressure
(e) increasing its octane number.
88. Duralumin alloy essentially contains copper and
(a) zinc (b) tin
(c) aluminium (d) lead
(e) iron.
89. In brass, copper is alloyed with
(a) tin (b) zinc
(c) aluminium (d) lead
(e) nickel.
90. Alloy of copper and tin is called
(a) brass (b) bronze
(c) duralumin (d) gun metal
(e) babbitt metal.
91. Monel metal is an alloy of copper and
(a) tin (b) zinc
(c) aluminium (d) nickel
(e) lead.
92. In transformer steel, the element which provides the required property is
(a) manganese (b) nickel
(c) silicon (d) chromium
(e) cobalt.
93. Incol is an alloy of
(a) nickel-chromium-iron
(b) nickel-copper-iron
(c) copper-zinc-iron
(d) nickel-molybdenum-iron
(e) nickel-chromium and molybdenum.
94. Puddling process is employed for converting
(a) pig iron into cast iron
(b) mild steel into alloy steel
(c) pig iron into wrought iron
(d) cast iron into mild steel
(e) pig iron into desired steel.
95. Pig iron may be called basic or acid, depending upon its

- (a) phosphorus content
 (b) sulphur content (c) silicon content
 (d) slag content (e) manganese content.
96. The component that influences the fluidity of molten iron most is
 (a) silicon (b) manganese
 (c) sulphur (d) phosphorus
 (e) lead.
97. The sizing of the particles may be achieved by
 (a) crushing (b) grinding
 (c) screening
 (d) electrostatic separator
 (e) milling.
98. Grizzly is used for
 (a) crushing (b) grinding
 (c) screening
 (d) electrostatic separation
 (e) precipitation.
99. The operation to remove the scale formed during rolling is called
 (a) skimming (b) pickling
 (c) shot blasting (d) slitting
 (e) descaling.
100. Rotary swaging is a
 (a) rolling operation
 (b) extrusion operation
 (c) forging operation
 (d) sheet metal forming operation
 (e) drawing operation.
101. Hot shortness in a forged product results in development of
 (a) scab (b) porous structure
 (c) flash (d) surface cracking
 (e) hot terms.
102. During closed die forgings, the defect produced by folding two surfaces of metal against each other without welding completely is called
 (a) scab (b) cold shut
 (c) flash (d) surface cracks
 (e) hot tear.
103. The extrusion force doesn't depend upon the
 (a) extrusion ratio
 (b) type of extrusion process
 (c) working temperature
 (d) material of the die orifice
 (e) speed of deformation.
104. A material has a high stiffness value when
 (a) its deformation in the elastic range is relatively small
 (b) its ability to absorb internal work or energy in the elastic range is high
 (c) its ability of deform in the plastic range is high
 (d) its ability to resist loads without fracture is high
 (e) it can absorb high values of strain energy in the plastic range.
105. In situations where unforeseen loads, exceeding the yield loads are likely to be encountered, the material must possess following property in high value
 (a) toughness (b) plastic strength
 (c) stiffness (d) resilience
 (e) ductility.
106. A desirable property for the parts subjected to shock or impact is
 (a) toughness (b) resilience
 (c) ductility (d) malleability
 (e) fibrous structure.
107. Chills in castings are used to
 (a) prevent shifting of the core from its original position
 (b) reduce good flowing property of molten metal, whenever required
 (c) promote good directional and progressive solidification
 (d) reduce the cleaning and fettling cost of the casting
 (e) induce hardness.
108. In shot blasting, metal shots used are made of
 (a) brass (b) bronze
 (c) steel (d) tungsten
 (e) aluminium.
109. In the case of shell moulding
 (a) pattern is not used
 (b) cold pattern is used
 (c) hot pattern is used
 (d) pattern made of plaster is used
 (e) pattern made of wax is used.
110. In shell moulding, finer grain sand is mixed with
 (a) phenolic resin
 (b) bentonite
 (c) sodium silicate

- (d) urea formaldehyde
(e) urea furfural resin.
111. In carbon-dioxide process, following sand is used
(a) high silica sand (b) zircon sand
(c) chromite sand
(e) sodium silicate sand
(e) urea formaldehyde resin
112. Which of the following gas contains maximum amount of carbon monoxide ?
(a) coke oven gas (b) water gas
(c) blast furnace gas (d) L.D. converter gas
(e) blue gas.
113. Temporary hardness of water can be removed by
(a) addition of alum (a coagulant)
(b) boiling
(c) filtration (through gravity sand filter)
(d) addition of lime (e) adding hydrazine.
114. Specific surface of a material is expressed as a ratio of
(a) mass to volume (b) surface to density
(c) density to volume
(d) surface to volume
(e) surface to mass.
115. Zeolite used in water softening process (cation exchange) is regenerated by washing with
(a) brine (b) chloramines
(c) sodium bisulphite
(d) liquid chlorines
(e) sulphuric acid.
116. Lime and soda ash are added to water to remove
(a) bicarbonates and sulphates of calcium and magnesium
(b) undesirable taste and odour
(c) bacteria (d) its corrosiveness
(e) acids.
117. The main use of activated carbon in water treatment is to control
(a) bacterial growth (b) taste and odour
(c) turbidity (d) dissolved oxygen
(e) hardness.
118. Alum $[Al_2(SO_4)_3]$ is used as a coagulant in water treatment to remove
(a) colour (b) turbidity
(c) bacteria (d) all of the above

- (e) none of the above.
119. The yield strength of a material is determined by the following test
(a) compression (b) tension
(c) fatigue (d) hardness
(e) endurance.
120. Vulcanisation of rubber
(a) decreases its tensile strength
(b) increases its ozone and oxygen reactivity
(c) increases its oil and solvent resistance
(d) converts its plasticity into elasticity
(e) reinforces the rubber suitably.
121. The most important property of a fuel to be considered for spark ignition engines is
(a) lower heating value
(b) volatility (c) sulphur content
(d) flash point
(e) octane number rating.
122. Iso-octane is designated as 100 octane number. The knock rating of a fuel of anti-knock quality better than Iso-octane is designated in terms of
(a) octane number (b) ignition quality
(c) cetane number
(d) performance number
(e) anti-knock effectiveness.
123. In tempering of alloy steels, the hardness rises to peak value, following by a gradual drop. This phenomenon is known as
(a) auto-tempering (b) age-hardening
(c) secondary-hardening
(d) precipitation-hardening
(e) austempering.
124. Temper brittleness may be fairly detected by
(a) tensile test (b) fatigue test
(c) creep test
(d) notched bar impact test
(e) hardness test.
125. Which of the following heat-treatment is applied to steel castings
(a) sub-critical annealing
(b) full-annealing (c) normalising
(d) quenching (e) tempering.
126. Pick up the correct statement
(a) The main purpose of quenching is to transform the austenite of steel to fine pearlite

- (b) Steels can be hardened and strengthened only by proper heat treatment
- (c) All type of heat treatments strengthen and harden the steel
- (d) Martensitic transformation is a diffusion reaction
- (e) Hardenability is the measure of degree of depth to which steel can be hardened.
127. Liquefied Petroleum Gas (LPG) used for household cooking comprises mainly of
- (a) propane and butane
- (b) butane and ethane
- (c) methane and ethane
- (d) methane and carbon monoxide
- (e) ethane and carbon monoxide.
128. Pick up the wrong statement
- (a) The energy associated with an electron at absolute zero is maximum and this energy is called fermi energy
- (b) According to zone theory, electrons are assumed to move in a region of a periodic potential
- (c) According to free electron theory, electrons can move through lattice, when Pauli exclusion principle is satisfied
- (d) According to free electron theory, electrons are assumed to move in a region of constant potential
- (e) Electrical conduction is possible in a solid, consisting of overlapping zone.
129. Dielectric materials are
- (a) conductors (b) semi-conductors
- (c) insulators (d) super-conductors
- (e) transistors.
130. Main constituent of natural gas is
- (a) CH_4 (b) C_2H_2
- (c) C_2H_4 (d) C_2H_6
- (e) CO.
131. Sweetening of petroleum product means removal of
- (a) sulphur and its compounds
- (b) water (c) organic impurities
- (d) wax (e) all of the above.
132. Octane number of gasoline is a measure of its
- (a) knocking tendency
- (b) ignition delay
- (c) ignition temperature
- (d) smoke point
- (e) detonating tendency.
133. Cetane number of a diesel fuel is the measure of its
- (a) ignition delay (b) smoke point
- (c) viscosity (d) oxidation stability
- (e) knocking tendency.
134. Which of the following has the highest octane number and lowest cetane number
- (a) aromatics (b) *i*-paraffin
- (c) naphthenes (d) olefins
- (e) *n*-paraffins.
135. Pick up the wrong statement
- (a) The solubility of carbon in gamma iron is same as that in alpha iron
- (b) In the transformation of austenite to pearlite at about 600°C , alternate layers of ferrite and cementite grow
- (c) In the transformation of austenite below 535°C to 200°C , ferrite and cementite are arranged in feathery or acicular form to constitute bainite
- (d) Silicon is a non-carbide forming alloy
- (e) The presence of strong carbide forming alloys in steel decreases the hardness, when tempered over a certain range of temperature.
136. The low expansion coefficient of "Invar" is exhibited due to the presence of the following alloying element
- (a) silicon (b) chromium
- (c) cobalt (d) nickel
- (e) vanadium.
137. Which of the following elements is used as an alloying element in leaf and coil springs
- (a) nickel (b) chromium
- (c) vanadium (d) cobalt
- (e) molybdenum.
138. Sinking is a process to produce
- (a) ingots (b) rods and wires
- (c) tubes (d) sheets
- (e) complex forgings.
139. In which of the following cases, the strength of joint obtained is lowest
- (a) welding (b) brazing
- (c) soldering (d) rivetting
- (e) bolts and nuts.
140. Which of the following gases, if used would not cause porosity in the welded metal joint

- (a) oxygen (b) nitrogen
(c) hydrogen (d) hydrogen-sulphide
(e) none of the above.
141. The presence of moisture generally stimulates corrosion because moisture
(a) is more reactive
(b) can penetrate easily into metals
(c) increases the thermal conductivity of environment by evaporation
(d) increases the electrical conductivity of environment in contact with the surface
(e) all of the above.
142. One Faraday of electricity liberates following amount of metal
(a) one gram
(b) one gram equivalent
(c) one gram mole (d) one mole
(e) one atomic mass.
143. When two different metals are immersed in one of its salts in aqueous solutions
(a) more electro-positive metal is oxidised
(b) more electro-positive metal is reduced
(c) less electro-positive metal only takes part in reaction
(d) more electro-positive metal remains unaffected
(e) both electro-positive and electro-negative metals remain unaffected.
144. Voltage needed for electrolysis is reduced by
(a) high current density and high temperature
(b) low current density and low temperature
(c) high current density and low temperature
(d) low current density and high temperature
(e) none of the above.
145. In an electrolysis cell, consisting of platinum electrodes dipped in a dilute solution of sulphuric acid
(a) oxygen doesn't evolve
(b) oxygen evolves at cathode
(c) oxygen evolves at anode
(d) oxygen evolves both at anode and cathode
(e) oxygen is dissolved at anode.
146. Electrodeposition of base metal, from its aqueous solution of salt is impossible, because base metal is
(a) chemically inert (b) more reactive
(c) readily oxidised
(d) of low melting point
(e) alkaline.
147. A straight rectangular bar of mass m , length L , pivoted on its centre and rotating around its centre will have moment of inertia J around the axis of rotation
(a) $\frac{mL^2}{2}$ (b) $\frac{mL^2}{3}$
(c) $\frac{mL^2}{6}$ (d) $\frac{mL^2}{12}$
(e) $\frac{mL^2}{24}$.
148. A bus weighing around 8500 kg is moving at a speed of 100 km/hr. Its kinetic energy compared to a solid flywheel weighing 1500 kg, revolving at 1800 r.p.m. will roughly be
(a) same (b) $1\frac{1}{2}$ times
(c) 2 times (d) $2\frac{1}{2}$ times
(e) 3 times.
149. In connection with reliability the abbreviation MTBF stands for
(a) Mean Time Between Failures
(b) Mean Time Before Failures
(c) Maximum Time Between Failures
(d) Minimum Time Between Failures
(e) Main Time Before Fault.
150. In connection with reliability the abbreviation MTTR stands for
(a) Minimum Time to Repair
(b) Maximum Time to Repair
(c) Mean Time to Repair
(d) Mean Time to Reliability
(e) Main Theme to Reliability.
151. Availability of an equipment or system is expressed as
(a) $\frac{MTBF + MTTR}{MTTR}$ (b) $\frac{MTBF - MTTR}{MTBF}$
(c) $\frac{MTBF}{MTBF + MTTR}$ (d) $\frac{MTBF}{MTBF - MTTR}$
(e) $\frac{MTTR}{MTBF + MTTR}$
152. Rotary kilns in cement industry are lined with
(a) fire clay (b) silica
(c) reinforced cement concrete
(d) high alumina and high magnesia bricks
(e) ceramic tiles.

153. The cementite is
 (a) iron carbide
 (b) a mixture of ferrite and iron-carbide
 (c) a mixture of pearlite and iron-carbide
 (e) alpha iron and iron carbide.
154. Pick up the wrong statement
 (a) Steel is generally considered as carbon containing up to two per cent and carbon being present as graphite
 (b) In general, cast iron contains carbon not less than 2 per cent
 (c) The steel which contains more than 0.8 per cent carbon is called hyper-eutectoid steel
 (d) The eutectoid steels, contain 0.8 per cent carbon
 (e) Martensite is a supersaturated solution of carbon in alpha iron and has a body centred tetragonal structure.
155. In basic Bessemer converter, steel can be made in about
 (a) 10 minutes (b) 25 minutes
 (c) 1 hour (d) 2 hours
 (e) 4 hours.
156. Pick up the wrong statement
 (a) The permeability of moulds made by coarser grain sand is more than that of finer sands
 (b) The permeability meter does not give the direct reading of permeability number of standard specimen
 (c) The fusion point of coarser grain sand is more than that of finer sand
 (d) Shatter test is performed to find the toughness of sand
 (e) Green hardness number of moulding sand is not read directly but it is calculated by formula.
157. Malleable iron is obtained after malleablising of
 (a) gray cast iron (b) white cast iron
 (c) mottled cast iron (d) nodular cast iron
 (e) ductile cast iron.
158. If a uniform beam of length l is vibrating in flexure, its natural frequency of vibration is proportional to
 (a) l (b) $1/l$
 (c) l^2 (d) $1/l^2$
 (e) $1/l^4$.
159. Accelerometers are high natural frequency instruments. Their useful frequency range is
 (a) near resonance (b) below resonance
 (c) above resonance (d) far above resonance
 (e) not related with resonance.
160. If mass can be considered to be concentrated at a single point and if δ be the statical deflection of the shaft at the position of the concentrated mass, then the critical speed is proportional to
 (a) δ (b) $\frac{1}{\delta}$
 (c) $\sqrt{\delta}$ (d) $\frac{1}{\sqrt{\delta}}$
 (e) $\frac{1}{\delta^2}$.
161. The efficiency of roller-chain drives is of the order of
 (a) 50–60% (b) 70–85%
 (c) 90–95% (d) 95–97%
 (e) 98–99%.
162. Sprockets for roller-chain drives for high speed service should have following number of teeth
 (a) 13–16 (b) 18–24
 (c) 30–42 (d) 46–58
 (e) 60–75.
163. Inverted tooth chain drive is also known as
 (a) gear drive
 (b) dynamic chain drive
 (c) silent chain drive
 (d) positive chain drive
 (e) frictionless chain drive.
164. The commonly used centre distance in the case of chain drives is
 (a) 10 ± 2 pitches of chain
 (b) 16 ± 4 pitches of chain
 (c) 25 ± 5 pitches of chain
 (d) 40 ± 10 pitches of chain
 (e) 60 ± 20 pitches of chain.
165. If speed of a flywheel is halved, then for same performance its weight has to be increased
 (a) twice (b) four times
 (c) eight times (d) reduced
 (e) need not be changed.
166. Pick up the wrong statement about means of improving steam engine economy

- (a) mixing of inlet and outlet ports to keep them hot
 - (b) use of steam jackets to keep cylinders and heads hot and dry
 - (c) compounding to reduce condensation losses
 - (d) superheating to impart steam vapour the properties of gas
 - (e) uniflow arrangement to reduce initial condensation.
167. The volumetric clearance in steam engines should be made as small as possible with Corliss valves, its value is of the order of
- (a) 12–15% (b) 6–10%
 - (c) 4–8% (d) 2–4%
 - (e) 1–2%.
168. Pessimistic time in PERT analysis is the
- (a) maximum time which an activity might require
 - (b) average time required for a job
 - (c) time that has the highest probability of occurrence associated with it
 - (d) minimum time in which an activity can possibly be accomplished
 - (e) earliest possible time that an event can be reached or an activity completed.
169. The binding material in diamond tools is
- (a) cobalt (b) graphite
 - (c) carbon
 - (d) a sort of adhesive chemical
 - (e) none of the above.
170. Which of the following is not an incentive plan
- (a) Halsey plan
 - (b) Taylor, 100% incentive plan
 - (c) Gantt plan (d) Rowan plan
 - (e) Standard plan.
171. Investment casting uses pattern made of
- (a) mercury (b) special sand
 - (c) plastic (d) clay
 - (e) wax.
172. Cast iron pipes are cast by
- (a) loam moulding process
 - (b) die casting process
 - (c) centrifugal casting process
 - (d) investment casting process
 - (e) vacuum moulding process.
173. A sprue is
- (a) tool used in mould repairing

- (b) used for cleaning casting
 - (c) vent hole to allow for the hot gases to escape
 - (d) a vertical passage through the cope and connecting pouring basin to the runner of gate
 - (e) passage through which metal is poured into the mould.
174. High sulphur content, too low pouring temperature, very hard ramming results in following defects in castings
- (a) hot tears (b) crush
 - (c) shifts (d) shut
 - (e) drop.
175. A steel specified as St 60 has
- (a) iron content of 60%
 - (b) coefficient of elasticity of 60 tonnes/cm²
 - (c) tensile strength of 60 kg/cm²
 - (d) tensile strength of 60 kg/mm²
 - (e) shear strength of 60 tonnes/cm².
176. In the cam, the distance between the base circle and the nose is called
- (a) flank (b) lobe
 - (c) throw (d) lift
 - (e) displacement.
177. Dirt or gum in fuel nozzle or jets may cause
- (a) excessive fuel consumption
 - (b) lack of engine power
 - (c) smoky black exhaust
 - (d) white exhaust
 - (e) uneven engine speed.
178. Deposit of carbon in the exhaust system will
- (a) increase back pressure
 - (b) reduce back pressure
 - (c) have no effect on back pressure
 - (d) result in black smoke
 - (e) increase noise level.
179. Aluminium cylinder blocks require liners of following material
- (a) mild steel (b) aluminium
 - (c) brass (d) cast iron
 - (e) stainless steel.
180. The function of oil scraper rings is to
- (a) retain compression
 - (b) lubricate cylinder walls
 - (c) thoroughly mix lub oil with fuel
 - (d) lubricate crank shaft bearings
 - (e) reduce piston wear.

Model Test Paper-5

Attempt all the questions. Each question carries equal marks.
Total time for attempting 180 questions is one hour.

1. Arrange the following metals in correct decreasing order of their modulus of elasticity: Copper, tungsten, lead, steel, beryllium
(a) tungsten, beryllium, steel, copper, lead
(b) tungsten, steel, copper, beryllium, lead
(c) steel, tungsten, copper, lead, beryllium
(d) copper, steel, tungsten, lead, beryllium
(e) tungsten, steel, beryllium, copper, lead.
2. Poisson's ratio for commonly used metals varies from 0.17 to 0.45. The metals with minimum and maximum values are
(a) tungsten, lead (b) cast iron, steel
(c) lead, tungsten (d) lead, steel
(e) aluminium, copper.
3. A structural steel is designated as St 32 K. Here 32 stands for
(a) specific limit for phosphorous content
(b) maximum content of other elements in %
(c) maximum tensile strength in kg/mm^2
(d) average carbon content in hundredths of a per cent
(e) minimum tensile strength in kg/mm^2 .
4. A tool steel is designated as T 90 s. Here 90 stands for
(a) specific limit for phosphorous content
(b) maximum content of other elements in %
(c) maximum tensile strength in kg/mm^2
(d) average carbon content in hundredths of a per cent
(e) minimum tensile strength in kg/mm^2
5. Wrought aluminium and cast aluminium are designated by following number of digits respectively
(a) 6, 5 (b) 5, 6
(c) 5, 4 (d) 4, 5
(e) 6, 6.
6. Spheroidal or modular graphite iron is designated as SG 500/7. Here 500 and 7 stand for
(a) proof stress in N/mm^2 and elongation %
(b) tensile strength in N/mm^2 and impact strength in Nm
(c) tensile strength in N/mm^2 and elongation %
(d) tensile strength in kg/mm^2 and elongation %
(e) BHN and impact strength in joule.
7. As the percentage of carbon in carbon steel increases, the following properties : tensile strength, % minimum elongation, yield stress, and BHN respectively
(a) increase, increase, decrease, increase
(b) increase, decrease, decrease, increase
(c) increase, decrease, increase, decrease
(d) decrease, decrease, increase, increase
(e) increase, decrease, increase, increase.
8. Which of the following carbon steels would be suited for rivets
(a) C 60 (b) C 50
(c) C 20 (d) C 10
(e) all of the above.
9. Which of the following carbon steels would be recommended for making locomotive carriage, wagon tyres, springs etc.
(a) C 65 (b) C 55, MN 75
(c) C 45 (d) C 35
(e) C 15, MN 75.
10. Which alloy steel would you recommend for connecting rods
(a) 20 Mn 2 (b) 35 Ni 4 Cr 1
(c) 14 Mn 1 S14 (d) 55 Si 2 MN 90
(e) 35 Mn 2 Mo 45.

11. IS standards are applicable in India for steels. The standards applicable in Russia, France, Japan, Germany and Italy respectively are
 (a) GOST, UNI, JIS, DIN, AFNOR
 (b) DIN, AFNOR, JIS, AFNOR, GOST
 (c) GOST, AFNOR, JIS, UNI, DIN
 (d) AFNOR, GOST, JIS, UNI, DIN
 (e) GOST, AFNOR, JIS, DIN, UNI.
12. The correct symbol for high speed tool steel is
 (a) T 10 Cr 5 Mo 75 V 23
 (b) T 105 Cr 1 Mn 60
 (c) T 140 W 4 Cr 50
 (d) T 50 Cr 1 V 23
 (e) T 75 W 18 Co 6 Cr 4 V 1 Mo 75.
13. Which of the following steel would result in good machinability and finish
 (a) 20 Mn 2 (b) 35 Mn 2 Mo 28
 (c) 40 Cr 1 (d) 14 Mn 1 S 14
 (e) 40 Mn 2 S 12.
14. The corrosion resistant steel castings are designated as Gr 1 to Gr 5. As the value increases from 1 to 5 following would increase continuously
 (a) Manganese content
 (b) Carbon content
 (c) Tensile strength
 (d) Per cent elongation
 (e) BHN.
15. Heat resistant, alloy steel castings are designated as Grade 4, 5, 6 and 7. As the value of the grade increases, the following also increases continuously
 (a) Carbon content
 (b) Tensile strength
 (c) Percent elongation
 (d) Chromium content
 (e) Nickel content.
16. As the carbon content in carbon steel increases, the elongation % and impact value respectively
 (a) increase, increase
 (b) increase, decrease
 (c) decrease, increase
 (d) decrease, decrease
 (e) not predictable.
17. Brinell hardness of around 240 is possible with following carbon steel
 (a) C 50 (b) C 45
 (c) C 40 (d) C 35
 (e) C 30.
18. Tensile strength of structural steel St 50 is of the order of
 (a) 50–60 N/m² (b) 50–60 N/cm²
 (c) 500–600 kg/cm² (d) 500–600 kg/mm²
 (e) 500–600 N/mm².
19. A steel is specified as En 42.
 This is as per following standard
 (a) French (b) American
 (c) Japanese (d) British
 (e) Russian.
20. As the percentage of copper increases and the percentage of lead decreases in brasses
 (a) tensile strength decreases
 (b) brinell hardness decreases
 (c) percentage elongation increases
 (d) all of the above
 (e) reverse of (a), (b) and (c).
21. Anti-friction bearing alloys are given grades from 90 to 1. The following grades are selected for lining of petrol and diesel engine bearings, and for heavy duty bearings as for rolling mills in sugar/steel industry
 (a) 90, 6 (b) 6, 90
 (c) 75, 1 (d) 1, 75
 (e) 60, 1.
22. For lower Brinell hardness number (170–78) the following corresponding Rockwell number is applicable
 (a) A (b) B
 (c) C (d) D
 (e) E.
23. The diamond pyramid hardness numbers (DPHN) corresponding to Brinell hardness numbers (BHN) of 149, 207, 277, 341 are 149, 209, 278, 344. The DPHN corresponding to BHN of 780 will be roughly
 (a) 780 (b) 868
 (c) 944 (d) 1022
 (e) 1224.
24. The tensile strength of cast aluminium in kg/mm² in terms of BHN can be expressed as
 (a) 0.26 BHN (b) 0.35 BHN
 (c) 0.40 BHN (d) 0.44 BHN
 (e) 0.55 BHN.
25. The tensile strength of plastics in kg/mm² varies from

- (a) 0.01 to 0.1 (b) 0.12 to 9.8
(c) 10 to 45 (d) 50 to 90
(e) 110 to 150.
26. The microstructures of 0.6% and 1.6% carbon steels at 800°C will be
(a) ferrite, austenite
(b) ferrite + pearlite, pearlite + cementite
(c) ferrite + cementite, pearlite + graphite
(d) austenite + cementite, ferrite + austenite
(e) ferrite + austenite, austenite + cementite.
27. The structural constituent 'pearlite' is stable
(a) at temperature below 723°C
(b) at temperature above 723°C
(c) at temperature below AC_3
(d) at temperature upto 500°C
(e) at temperature above AC_3 .
28. The BHN of cementite is of the order of
(a) 160-230 (b) 270-320
(c) 330-400 (d) 750-700
(e) 820.
29. Eutectoid mixture of cementite and ferrite is called
(a) austenite (b) pearlite
(c) martensite (d) bainite
(e) ledeburite.
30. Highly dispersed mixture of ferrite and carbides exists in
(a) troostite (b) sorbite
(c) ledeburite (d) martensite
(e) pearlite.
31. In process annealing treatment, the hypoeutectoid steel is heated at
(a) $AC_3 + 20$ to 30°C
(b) $AC_1 + 20$ to 30°C
(c) between AC_1 and AC_3
(d) $AC_3 + 150$ to 250°C
(e) $AC_1 - 15$ to 30°C.
32. Which salt is used for heating in salt bath for hardening at a temperature range of 1100-1350°C
(a) common salt
(b) soda ash
(c) potassium chloride
(d) calcium chloride
(e) barium chloride.
33. Three pieces (round, square, and rectangular in shape) are to be heat treated. The heating time per mm diameter or thickness of article in increasing order are
(a) square, round, rectangular
(b) round, square, rectangular
(c) square, rectangular, round
(d) round, rectangular, square
(e) rectangular, square, round.
34. Four options are available to obtain furnace temperature of 800°C (oil furnace, salt bath, electric furnace and lead bath). The heating times in decreasing order for heating the articles would be
(a) electric furnace, oil furnace, salt bath, lead bath
(b) lead bath, oil furnace, salt bath, electric furnace
(c) salt bath, oil furnace, lead bath, electric furnace
(d) electric furnace, salt bath, lead bath, oil furnace
(e) lead bath, salt bath, oil furnace, electric furnace.
35. For which metal, heating is not necessary for hot working
(a) gold (b) lead
(c) silver (d) tin
(e) all of the above.
36. At different temperature ranges, the colour of steel changes. As temperature increases from 550 to 1300°C, the colour changes as under
(a) red, white, yellow, orange
(b) white, orange, red, yellow
(c) red, orange, yellow, white
(d) red, yellow, orange, white
(e) orange, red, yellow, white.
37. During tempering of steel, it attains different colours at different temperatures. The colours observed as the tempering temperature of steel is increased from 220°C to 330° are
(a) yellow, brown, purple, blue, grey
(b) yellow, purple, grey, brown, blue
(c) blue, grey, purple, yellow, brown
(d) brown, purple, blue, yellow, grey
(e) grey, blue, purple, brown, yellow.
38. With increase in percentage of carbon in plain carbon steel, more hardness can be obtained. At 0.2% carbon, maximum hardness obtainable in plain carbon steel is between 40 to 50 R_c . At 1% carbon, the corresponding value is

- (a) 55–60 R_c (b) 62–68 R_c
 (c) 70–75 R_c (d) 77–85 R_c
 (e) 90–100 R_c .
39. The nitriding operation is carried by heating steel in sodium salt or potassium salt bath furnace at a temperature of
 (a) 450°C (b) 565°C
 (c) 620°C (d) 728°C
 (e) 840°C.
40. Which of the following heat treatment process is best suited for minimum distortion during quenching for parts with section thickness less than 5 mm
 (a) hardening (b) tempering
 (c) martempering (d) flame hardening
 (e) nitriding.
41. Which of the following heat treatment process is best suited for obtaining toughness for hardened components
 (a) flame hardening
 (b) nitriding
 (c) cyaniding
 (d) normalising
 (e) tempering.
42. The standards for steel used in France are
 (a) DIN (b) CSM
 (c) AFNOR (d) UNI
 (e) GOST.
43. The standards for steel used in Russia are
 (a) GOST (b) ASTM
 (c) JIS (d) UNI
 (e) DIN.
44. Which of the following heat treatment process is best suited for stress relieving, machinability and ductility for castings and deep drawn components
 (a) annealing (b) normalising
 (c) austempering (d) tempering
 (e) martempering.
45. Which of the following heat treatment process is best suited for increased notch-toughness at a given hardness without crack in springs, fasteners, levers, cylinder liners, pins, etc.
 (a) tempering (b) austempering
 (c) martempering (d) cyaniding
 (e) nitriding.
46. The case depth in hardening by nitriding is of the order of

OBJECTIVE TYPE QUESTIONS AND ANSWERS

- (a) 1–2 microns (b) 5–15 microns
 (c) around 0.1 mm (d) 1 mm
 (e) 1–2 mm.
47. Which combination of hole and shaft will you select for grease or oil lubricated bearings for gear shafts, small electric motor/pump shafts
 (a) H_2g_6 (b) H_7f_7
 (c) H_8e_3 (d) H_8d_9
 (e) H_9C_9 .
48. The tolerance value is $100i$ (i = standard tolerance unit) for the following IT grade
 (a) 6 (b) 8
 (c) 11 (d) 13
 (e) 15.
49. Which grade of hole is applicable for manufacturing process (internal grinding, broaching and reaming)
 (a) H_5 (b) H_7
 (c) H_9 (d) H_{10}
 (e) H_{11} .
50. Which combination of hole and shaft combination will you select for normal location and spigot fits
 (a) H_8h_8 (b) H_9c_9
 (c) H_8d_9 (d) H_8c_8
 (e) H_7f_7 .
51. Which of the following type of bearing will you select for combined radial and axial loads
 (a) single row angular contact ball bearing
 (b) spherical roller bearing
 (c) cylindrical roller bearing
 (d) spherical roller thrust bearing
 (e) taper roller bearing.
52. Which of the following type of bearing will you select for high load carrying, self aligning type for heavy radial loads with considerable axial load in both directions
 (a) spherical roller bearing
 (b) spherical roller thrust bearing
 (c) taper roller bearing
 (d) double row angular contact ball bearing
 (e) self aligning ball bearing.
53. Double row angular contact ball bearing is used for applications involving
 (a) heavy axial loads
 (b) radial loads with heavy thrust in both directions
 (c) combined radial and axial loads

- (d) axial load in one direction only
- (e) axial load in both directions.

54. The circlip shown in Fig 1 is

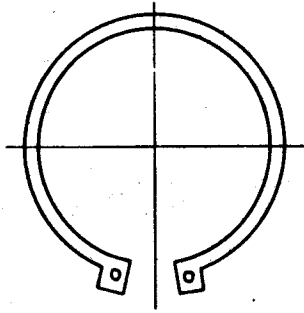


Fig. 1

- (a) internal circlip
- (b) external circlip
- (c) radial circlip
- (d) axial circlip
- (e) universal circlip.

55. The three bearings shown in Fig. 2 from left to right are

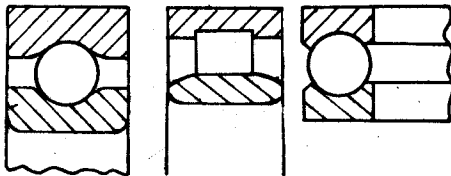


Fig. 2

- (a) deep groove, roller, thrust
- (b) roller, deep groove, thrust
- (c) self aligning, roller, thrust
- (d) roller, self aligning, thrust
- (e) angular contact, thrust, deep groove.

56. The circlip shown in Fig. 3 is

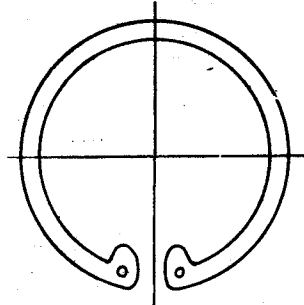


Fig. 3

- (a) external circlip
- (b) radial circlip
- (c) axial circlip
- (d) internal circlip
- (e) universal circlip.

57. Fig. 4 shows O-Rings and its application in sealing moving parts. The O-ring is designated by the dimensions

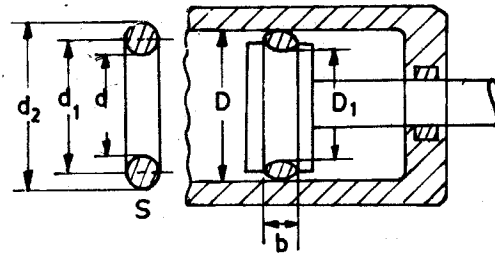


Fig. 4

- (a) $d \times S$
- (b) $d_1 \times s$
- (c) $d_2 \times S$
- (d) $D \times D_1$
- (e) $D \times b$.

58. Fig. 5 shown the cross section of rolled steel beam. Depending on size, it is designated as Indian Standard Junior beam, light beam, medium weight beam, wide flange beam or column section-H beam. The other dimensions specified are

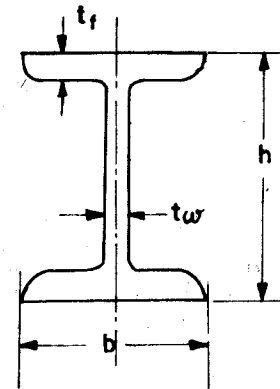


Fig. 5

- (a) h
- (b) b
- (c) $h \times b$
- (d) $b \times t_f$
- (e) $h \times t_w$.

59. Fig. 6 shown three sections. Their radius of gyration, modulus of section and area moment of inertia about axis XX vary in decreasing order as under

- (a) A,B,C,
- (b) B,C,A

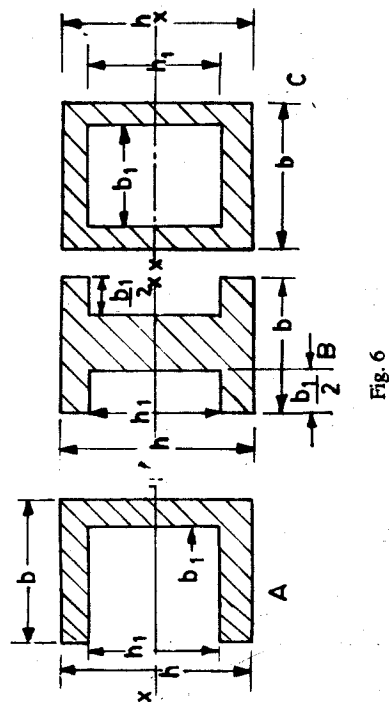


Fig. 6

- (c) A, C, B (d) C, A, B
 (e) All have equal values.

60. The rivet heads used for general purposes shown in Fig. 7 (from left to right) are

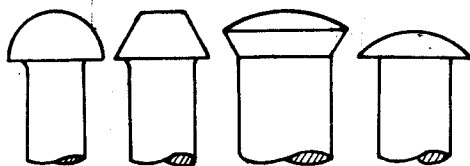


Fig. 7

- (a) snap, pan, mushroom, round countersunk
 (b) snap, pan, round countersunk, mushroom
 (c) pan, snap, round countersunk, mushroom
 (d) flat, snap, mushroom, countersunk
 (e) snap, flat countersunk, pan, flat.

61. The boiler rivet heads shown in Fig. 8 from left to right are

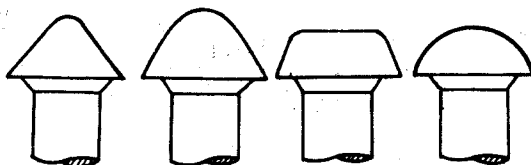


Fig. 8

- (a) steeple, conical, pan, ellipsoid
 (b) conical, snap, countersunk, pan
 (c) steeple, snap, pan, ellipsoid
 (d) pan, snap, countersunk, ellipsoid
 (e) conical, steeple, pan, snap.

62. If rivet diameter is 48 mm, rivet hole diameter will be approximately

- (a) 48 mm (b) 47 mm
 (c) 49 mm (d) 50 mm
 (e) 52 mm.

63. Fig. 9 shown the basic profile of ISO metric screw thread. The dimensions A and B in terms of H are

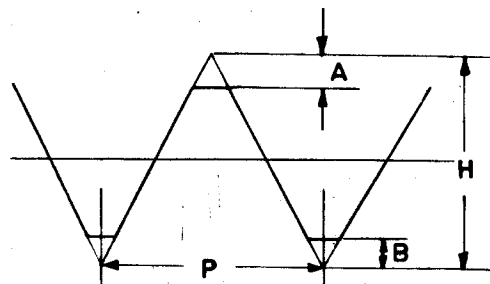


Fig. 9

- (a) $\frac{H}{8}$ and $\frac{H}{8}$ (b) $\frac{H}{4}$ and $\frac{H}{4}$
 (c) $\frac{H}{4}$ and $\frac{H}{8}$ (d) $\frac{H}{8}$ and $\frac{H}{4}$
 (e) $\frac{H}{5}$ and $\frac{H}{5}$

64. The relationship between P and H in Fig. 9 is

- (a) $H = P$ (b) $H = \frac{3}{4} P$
 (c) $h = \frac{7}{8} P$ (d) $H = 0.8P$
 (e) $H = 0.86603P$.

65. The included angles for ISO metric threads and standard pipe threads are

- (a) $55^\circ, 60^\circ$ (b) $57\frac{1}{2}^\circ, 60^\circ$
 (c) $60^\circ, 55^\circ$ (d) $62\frac{1}{2}^\circ, 57\frac{1}{2}^\circ$
 (e) $65^\circ, 55^\circ$.

66. As ISO metric threaded component is designated as M 16 × 1.5. Here 16 is

- (a) pitch (b) major diameter
 (c) pitch diameter (d) minor diameter
 (e) depth of thread.

67. Fig. 10 shows the design profile of nut and bolt of ISO Metric thread. Dimension A =

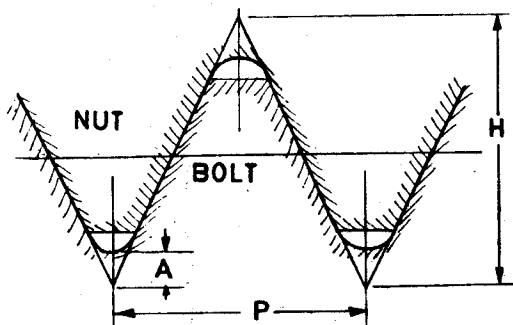


Fig. 10

- (a) H/4
- (b) H/5
- (c) H/6
- (d) H/7
- (e) H/8.

68. Fig. 11 shows a rolled steel equal angle. The radii of gyration $r_{xx} = r_{yy}$ for this section and its value is equal to

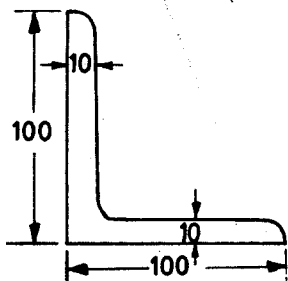


Fig. 11

- (a) 15 mm
- (b) 20 mm
- (c) 25 mm
- (d) 30.5 mm
- (e) 40 mm.

69. The tensile strength of carbon steel in kg/mm^2 can be approximately expressed in relation to BHN as follows

- (a) 0.23 BHN
- (b) 0.35 BHN
- (c) 0.45 BHN
- (d) 0.55 BHN
- (e) 0.75 BHN.

70. The bearing shown in Fig. 12 is a single row

- (a) deep groove type
- (b) self aligning type

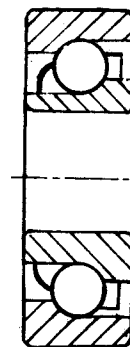


Fig. 12

- (c) angular contact type
- (d) single thrust type
- (e) cylindrical roller type.

71. Fig. 13 shows the elliptical and circular cross-sections. The ratio of area moment of inertias of elliptical and circular sections across axes XX and YY respectively are

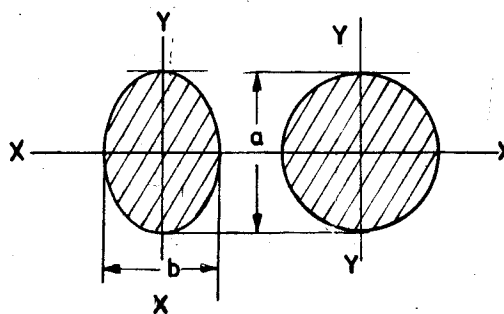
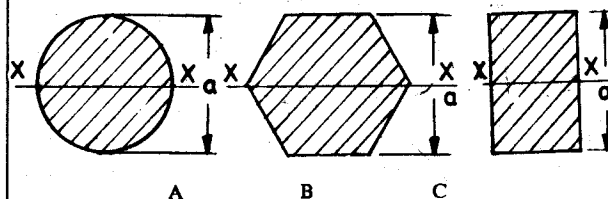


Fig. 13

- (a) 1, 1
- (b) $\frac{b}{a}, \frac{b^2}{a^2}$
- (c) $\frac{b^2}{a^2}, \frac{b^2}{a^2}$
- (d) $\frac{b}{a}, \frac{b^3}{a^3}$
- (e) $\frac{b^3}{a^3}, \frac{b}{a}$

72. The radii of gyration of five cross-sections shown in Fig. 14 in decreasing order are

- (a) A, B, C, D, E
- (b) B, C, D, A, E



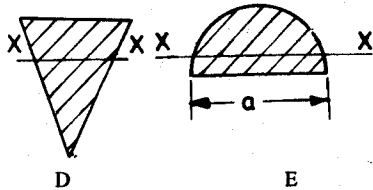


Fig. 14. (Height of triangular section is 'a').

- (c) E, A, D, C, B (d) C, B, D, A, E
 (e) C, B, A, D, E.

73. In Fig. 15 the reaction R_c at the centre of beam is equal to

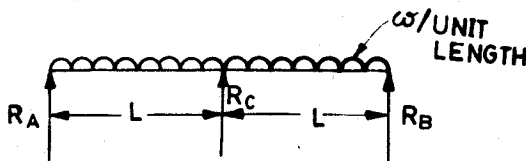


Fig. 15

- (a) wL (b) $2wL$
 (c) $\frac{wL}{2}$ (d) $\frac{10}{8}wL$
 (e) $\frac{3}{8}wL$.
74. In Fig. 15 maximum deflection occurs at
 (a) A and B (b) C
 (c) $\frac{1}{2}$ (d) $0.4215L$
 (e) $0.375L$.

75. In Fig. 16 the maximum deflection and maximum Bending Moment occur at

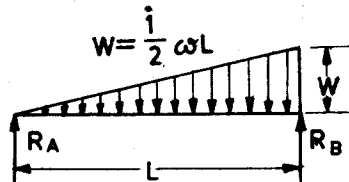


Fig. 16

- (a) centre of the beam
 (b) at point B
 (c) at $0.519L$, from A
 (d) at $0.5774L$ from A
 (e) at $0.519L$ and $0.5774L$ respectively from A.
76. For eccentrically loaded columns, the following formula is applicable
 (a) Johnson's parabolic
 (b) Sraight line

- (c) Ritter's
 (b) Rankine
 (e) Secant.

77. In the Rankine formula for columns,

$$P_c = \frac{AS_c}{1 + C \left(\frac{L}{r}\right)^2}$$

value of C increases more and more in the order for the following materials

- (a) Timber, steel, C.I. W.I.
 (b) Timber, C.I., steel, W.I.
 (c) W.I., steel, C.I, timber
 (d) W.I., C.I., steel, timber
 (e) Steel, W.I, C.I, timber.

78. For the type of loading down in Fig. 17, the correct Bending Moment diagram is as shown in figure 18

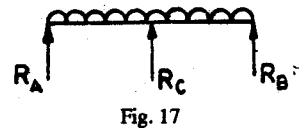


Fig. 17

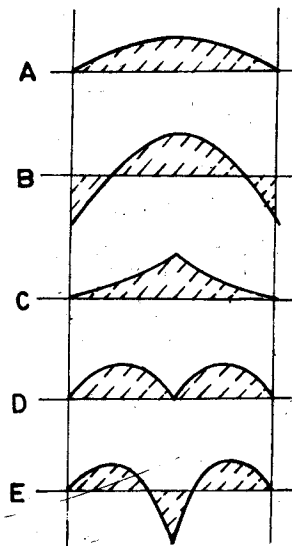


Fig. 18

- (a) A (b) B
 (c) C (d) D
 (e) E.

79. The ratio of maximum deflections in cases (a) and (b) in Fig. 19 is

- (a) 1
 (b) 1.5
 (c) 2

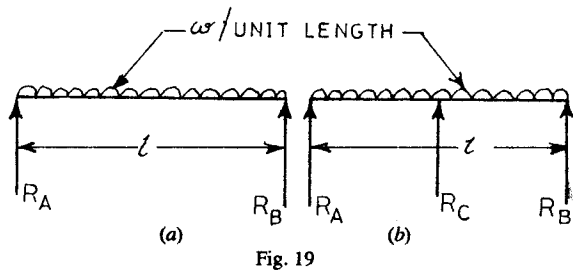


Fig. 19

- (d) 2.4
- (e) 3.5.

80. In figure 20, if prop at B is removed and A is firmly supported, then ratio of maximum deflections when beam acts as cantilever to when props are available at both ends will be

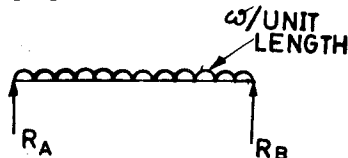


Fig. 20

- (a) 2.4
- (b) 5
- (c) 7.6
- (d) 9.6
- (e) 12.5.

81. The ratio of maximum deflections in (a) and (b) in Fig. 21 will be

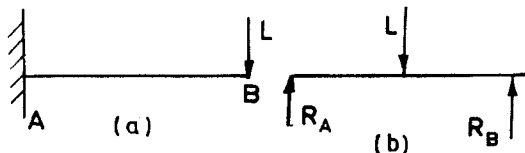


Fig. 21

- (a) 7.6
- (b) 9.6
- (c) 12
- (d) 16
- (e) 24.

82. In a spring-mass system, if a sturdy spring is used and static deflection is reduced to one-fourth, then the natural frequency of free vibrations of the system will
 (a) increase 2 times (b) increase 4 times
 (c) decrease 2 times (d) decrease 4 times
 (e) remain unaffected.

83. For forced vibration system with damping, which of the following ratio is unity at resonance condition

- (a) $\frac{\text{equivalent static deflection}}{\text{peak amplitude}}$

- (b) $\frac{\text{frequency of forced vibration}}{\text{natural frequency}}$
- (c) $\frac{\text{natural frequency of damped vibration}}{\text{frequency of forced vibration}}$
- (d) $\frac{\text{amplitude of resonance}}{\text{peak amplitude}}$
- (e) $\frac{\text{damping factor}}{\text{damping coefficient}}$

84. In the case of forced vibration system with damping, the steady state amplitude of vibration is maximum when the frequency ratio $\left(\frac{\omega}{\omega_n} = \frac{\text{frequency of force vibration}}{\text{natural frequency}}\right)$ is equal to

- (a) $\sqrt{1 - \xi^2}$
- (b) $\sqrt{1 - 2\xi^2}$
- (c) $\frac{1}{\sqrt{1 - 2\xi^2}}$
- (d) $\frac{1}{\xi} \sqrt{1 - 2\xi^2}$
- (e) $\frac{1}{2\xi \sqrt{1 - \xi^2}}$

where $\xi = \frac{C}{C_c} = \left(\frac{\text{damping coefficient}}{\text{critical damping coefficient}}\right) = \text{damping factor.}$

85. The endurance limit of mirror polished steel with increase in hardness remains constant. However the value of endurance limit is less under other conditions and decreases with increase in hardness of steel. Arrange the following conditions in correct order : (i) hot rolled, (ii) machined (iii) under ordinary water (iv) with sharp circular notch, (v) under salt water, (vi) polished ground

- (a) (i), (ii), (iii), (iv), (v), (vi)
- (b) (vi), (ii), (iv), (i), (iii), (v)
- (c) (vi), (iv), (ii), (iii), (i), (v)
- (d) (vi), (ii), (i), (iv), (v), (iii)
- (e) (vi), (ii), (iv), (iii), (v), (i).

86. The terms of the series of preferred numbers in Renard series R 20 are doubled in every

- (a) 2 terms
- (b) 3 terms
- (c) 6 terms
- (d) 12 terms
- (e) 20 terms.

87. The derived series R 20/3 is most frequently used ratio in machine tool design. It is formed with a step ratio of

- (a) $\sqrt{2}$
- (b) 2
- (c) $\sqrt{3}$
- (d) powers of 2
- (e) $1/\sqrt{2}$.

88. Given below is a series of preferred numbers : 1.00, 1.25, 1.60, 2.00, 2.50, 3.15, 4.00, 5.00, 6.30, 8.00, 10.00..... This belongs to
 (a) R 5 (b) R 10
 (c) R 20 (d) R 40
 (e) R 10/3.
89. Soderberg equation and Goodman equation are concerned with the safety factor in case of
 (a) static stresses (b) varying stresses
 (c) stress concentration
 (d) creep limit
 (e) wear and corrosion.
90. As the SAE number of lubricants increases,
 (a) flash point increases and viscosity decreases
 (b) flash point decreases and viscosity increases
 (c) both flash point and viscosity decrease
 (d) both flash point and viscosity increase
 (e) there is no relationship between flash point, viscosity and SAE number.
91. Which of the following journal bearing material is self lubricating type
 (a) wood (b) cast iron
 (c) babbitt (d) carbon graphite
 (e) sintered.
92. Which of the following journal bearing material needs no lubrication
 (a) carbon graphite (b) rubber
 (c) sintered (d) moulded plastic
 (e) bronze.
93. Which of the following bearing material needs water lubrication
 (a) rubber (b) wood
 (c) cast iron (d) moulded plastic
 (e) babbitt.
94. In hydrodynamic journal bearing, if the clearance ratio is halved, then Sommerfeld number (S) and coefficient of friction (μ) will change as follows
 (a) S becomes double and μ is halved
 (b) S becomes four times and μ is doubled
 (c) S becomes half and μ is doubled
 (d) S becomes four times and μ is halved
 (e) S becomes one fourth and μ is halved.
95. Most efficient power transmission is obtained from flat belts at speeds of
 (a) 2 to 5 m/sec
 (b) 5 to 10 m/sec
 (c) 12.5 to 17.5 m/sec
 (d) 17.5 to 22.5 m/sec
 (e) 25 to 35 m/sec.
96. Correct initial tension in 4,5 and 6 plies belt is obtained by cutting the belt shorter than the actual steel tape measurement around the pulleys on the following basis
 (a) 0.1 of shorter (b) 0.5% shorter
 (c) 1% shorter (d) 1.5% shorter
 (e) 2% shorter.
97. The load ratings in case of belt drives are developed for 180° of contact around pulley. These have to be corrected for actual arc of contact. A decrease in arc of contact implies additional load. The value of arc of contact correction factor for 120° of contact is
 (a) 1.08 (b) 1.13
 (c) 1.26 (d) 1.33
 (e) 1.68.
98. The crown on a pulley of 315 to 355 mm diameter is of the order of
 (a) 0.4 mm (b) 0.6 mm
 (c) 0.8 mm (d) 1.0 mm
 (e) 1.5 mm.
99. If D is the diameter of pulley, the thickness of arm of pulley is proportional to
 (a) D (b) \sqrt{D}
 (c) $\sqrt[3]{D}$ (d) $\sqrt[4]{D}$
 (e) none of the above.
100. The cross sections of the V-belts are designated as A, B, C, D, and E. As the symbol increases from A to E, which of the following is not true
 (a) nominal top width increases
 (b) nominal thickness increases
 (c) weight per metre of belt increases
 (d) the included angle of trapezium increases
 (e) pulley pitch diameter increases.
101. The length of V-belt is designated as
 (a) inside length
 (b) outside length
 (c) length at the centre of belt
 (d) pitch length
 (e) length at neutral axis.
102. According to Indian standards, roller chain is designated as 8.3D. Here, 8.3 stands for
 (a) pitch (b) roller diameter
 (c) width between inner plates

(d) plate depth (e) bearing area.

103. Figure 22 shows

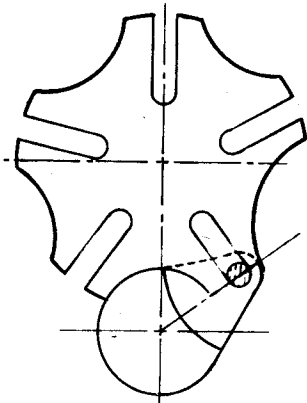


Fig. 22

- (a) Davy's gear
 (b) External Geneva mechanism
 (c) Geneva gear (d) Bewan mechanism
 (e) Ackerman's mechanism.

104. The cam for which three characteristic equations are as under will be :

$$(i) \text{ displacement } y = \frac{h}{2} \left(-\cos \frac{\pi\theta}{\beta} \right)$$

 h = maximum rise of follower β = cam angle for rise h , θ = cam angle for displacement ω = angular velocity of cam.

$$(ii) \text{ velocity } v = \frac{h\pi\omega}{2\beta} \left(\sin \frac{\pi\theta}{\beta} \right)$$

$$\text{and (iii) acceleration } a = \frac{h}{2} \left(\frac{\pi\omega}{\beta} \right)^2 \cos \frac{\pi\theta}{\beta}$$

- (a) straight line (b) circular arc
 (c) SHM (d) double harmonic
 (e) cycloidal.

105. For best conditions of sliding in ratchet and pawl mechanism, the ratchet tooth angle in comparison to friction angle should be
 (a) more (b) less
 (c) equal (d) could be more or less
 (e) there is no such relationship.

106. If both the mean diameter and spring wire diameter of the spring be increased twice then the deflection of spring will
 (a) remain same (b) increase twice
 (c) be halved (d) increase four times
 (e) be reduced four times.

107. If both the mean diameter and spring wire diameter of the spring be increased twice, then the shear stress induced in wire will
 (a) remain same (b) increase twice
 (c) be halved (d) increase four times
 (e) get reduced to one fourth.

108. If the mean diameter of spring is increased, twice, the natural frequency of spring will
 (a) remain same (b) increase twice
 (c) decrease twice (d) increase four times
 (e) decrease four times.

109. To avoid buckling of springs, the ratio of free length to mean diameter should be less than
 (a) 10 (b) 7
 (c) 5 (d) 3
 (e) 1.

110. The spring rate or spring stiffness is proportional to

- (a) d (diameter of wire)
 (b) d^2 (c) $\frac{1}{d}$
 (d) $\frac{1}{d^2}$ (e) $\frac{1}{d^4}$

111. If both the length of leaf spring and width of the leaf are increased twice, the deflection of leaf spring will

- (a) remain unaltered
 (b) increase twice
 (c) decrease twice
 (d) increase four times
 (e) decrease four times.

112. Which of the following is constant acceleration cam

- (a) cycloidal (b) parabolic
 (c) SHM (d) circular arc
 (e) polynomial.

113. Safe external load on bolt is proportional to

- (a) S (stress area of the bolt)
 (b) S^2
 (c) S^3 (d) $S^{3/2}$
 (e) $S^{3/4}$.

114. According of Indian standard specification, gear qualities are designated as 3 and 4 (high precision), 5 and 6 (precision), 7, 8 and 9 (medium), 10 and 12 (coarse). The speed of gears in m/sec permitted for medium precision (quality 8) in the case of cylindri-

cal, straight bevel, and spiral bevel gears respectively is

- (a) 8 to 15, upto 6, upto 12
- (b) 1 to 8, upto 3, upto 7
- (c) upto 3, 1 to 8, upto 7
- (d) upto 7, 1 to 8, upto 3
- (e) upto 7, upto 3, 1 to 8.

115. Cyclone fired boilers

- (a) have wet bottom furnace in which the ash is removed in the molten form
- (b) have bent tube furnace
- (c) have three steam drums and two mud drums
- (d) employ pulverised fuel firing
- (e) have stoker for firing of coal lumps.

116. The relative consumption by volume of oxygen and acetylene in oxyacetylene welding of mild steel is

- (a) 2.5 : 1 (b) 2 : 1
- (c) 1 : 1 (d) 1 : 2
- (e) 1 : 2.5.

117. In which of the following processes there is no wear of tool ?

- (a) ultrasonic machining
- (b) electrochemical machining
- (c) electro discharge machining
- (d) grinding
- (e) none of the above.

118. The tooth paste tubes are manufactured by

- (a) piercing (b) extrusion
- (c) rolling (d) casting
- (e) spinning.

119. The size of hole and shaft are respectively specified as

$$20^{+0.10}_{+0.05} \text{ mm and } 20^{+0.00}_{-0.05} \text{ mm}$$

The maximum and minimum clearances in the assembly of the two are

- (a) 0.15 and 0.05 mm
- (b) 0.10 and 0.05 mm
- (c) 0.25 and 0.00 mm
- (d) 0.15 and 0.10 mm
- (e) 0.10 and 0.00 mm.

120. List the following in the order of increasing machinability : grey cast iron, mild steel, brass, stainless steel

- (a) brass, grey cast iron, mild steel, stainless steel

- (b) grey cast iron, brass, stainless steel, mild steel
- (c) stainless steel, grey cast iron, mild steel, brass
- (d) grey cast iron, mild steel, stainless steel, brass
- (e) stainless steel, mild steel, grey cast iron, brass.

121. Ceramic cutting tools are made of

- (a) mixtures of oxides of aluminium
- (b) cast carbides
- (c) titanium carbide
- (d) cubic boron nitride
- (e) silicon oxide.

122. When a helical spring is compressed axially, the spring wire gets shear strain because

- (a) spring is subjected to torque
- (b) the wire nearly rotates
- (c) of fatigue
- (d) wire can't move freely
- (e) wire is circular in shape.

123. Shafts are generally finished by grinding but beams are used in as rolled condition because

- (a) shafts have to rotate in bearings but beams are supported at ends
- (b) shafts have to transmit torque but beams support dead load
- (c) shafts being circular can be easily machined but beams are difficult to be machined
- (d) shaft if not machined would be subjected to stress concentration but beams even in rolled condition are not subjected to stress concentration effect
- (e) shafts are produced economically by machining and beams by rolling because of shape.

124. The main functions of coatings on the electric arc welding electrodes are

- (a) isolating the welding zone from ambient air
- (b) enabling smooth merging of weld metal with base metal
- (c) enable stable burning of the arc
- (d) facilitate striking of arc
- (e) all of the above.

125. The methods of manufacturing steel seamless tubes are

- (a) forging hammers and forging presses
- (b) hot rolling and cold rolling

- (c) direct and forward extrusion
(d) piercing
(e) drawing and spinning.
126. The names of gear manufacturing processes based on generation of profile are
(a) sand casting and die casting
(b) hot rolling and extruding
(c) powder metallurgy and coining
(d) hobbing and shaping
(e) broaching and template.
127. The power is generated from water on account of its
(a) mass and force (b) momentum
(c) head and quantity
(d) gravitational force
(e) non compressibility.
128. The quantity of flow of water from the spiral case to the turbine runner is regulated by means of
(a) penstock and valve
(b) moving vanes
(c) intake gate (d) surge tank
(e) any one of the above.
129. A base load power station is one in which the power can be generated
(a) continuously at any rate
(b) continuously at constant rate
(c) frequently at a constant rate
(d) frequently at variable rate
(e) from pumped storage plant.
130. The sum of velocity head, pressure head and potential head is known as
(a) gross head
(b) net head (c) total head
(d) useful head
(e) none of the above.
131. The surge tanks in hydroelectric power stations are located at
(a) lowest level
(b) farthest from power station
(c) close to turbine
(d) at the top of dam
(e) closest to power house and at the highest ground.
132. It is possible to use 1, 2, 3, or 4 penstocks. It would be most economical to have
(a) 1 penstock (b) 2 penstocks
(c) 3 penstocks (d) 4 penstocks
(e) there is no such criterion.
133. Kaplan turbine is just a propeller turbine with
(a) tail race (b) draft tube
(c) adjustable blades (d) spiral casing
(e) surge tank.
134. Vertical shaft arrangement in hydroelectric plants is used to
(a) permit smallest power house
(b) encounter minimum vibrations
(c) have high efficiency
(d) have simpler structure
(e) permit use of smaller shaft and smaller rotor.
135. On account of high specific speed, the susceptibility to cavitation is more in case of
(a) Impulse turbine (b) Francis turbine
(c) Propeller turbine (d) Kaplan turbine
(e) all of the above.
136. A piece of sheet metal strip can be easily bent, while the same strip when formed into a channel shape becomes stiffer because of the increase of following in the latter case
(a) mass (b) resistance
(c) moment of inertia
(d) stiffness (e) all of the above.
137. Which of the following coolants is used in machining of aluminium
(a) soap solution (b) kerosene
(c) soluble oil solution
(d) EP cutting oil
(e) no coolant is used.
138. The pouring temperature while casting grey cast iron can be measured by
(a) mercury-in-steel thermometer
(b) bimetal type thermometer
(c) resistance temperature detector
(d) thermocouple
(e) radiation pyrometer.
139. The role of hunting tooth or hunting cog in a great transmission is that it
(a) increases efficiency of transmission
(b) distributes wear uniformly
(c) reduces vibrations
(d) reduces determination of speed
(e) permits stable operation.
140. The sections shown in Fig. 23 can be arranged in the order of increasing torsional rigidity as
(a) 1, 2, 3, 4 (b) 4, 3, 2, 1

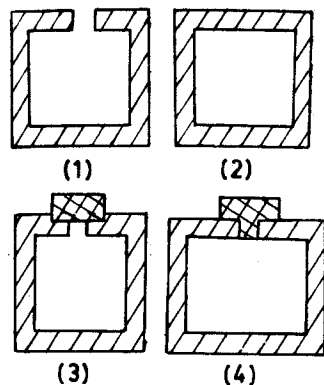


Fig. 23

- (c) 2, 1, 3, 4 (d) 2, 4, 3, 1
(e) 2, 1, 4, 3.
141. For increasing/decreasing the stiffness of a helical spring, one should
- increase/decrease diameter of spring
 - increase/decrease diameter of spring wire
 - increase/decrease length of spring
 - any one of the above
 - none of the above.
142. The 'coated carbide cutting tools' are coated with
- titanium carbide and titanium nitride
 - mixture of oxides of aluminium
 - cubic boron nitride
 - cobalt and molybdenum
 - silicon carbides.
143. AQL and AOQ in quality control stand for
- acceptable quality level and average out going quality
 - acceptable quality level and acceptable outgoing quality
 - acceptable queue limit and acceptable output quality
 - alarming quality level and alarming outgoing quality
 - average quality level and acceptable out going quality.
144. Blooming mill is concerned with
- power plants for pulverisation of coal
 - steel industry—a rolling mill for reducing steel ingots
 - petrochemical industries for distillation
 - machine shop—to produce precise parts
 - automation by robots.
145. Broaching operation is concerned with
- enlarging, smoothing and truing of holes
 - reducing cross-section of steel parts
 - corrosion resistance technique
 - making metal powder
 - heat treatment.
146. Brown and Sharpe Wire Gauge is the American standard wire gauge in which the numbers descend from 48 to 1 and then from 0 to 0000. The corresponding range of diameter varies from
- 1 mm to 25 mm
 - 25 mm to 1 mm
 - 1 micron to 10 mm
 - 10 mm to 1 mm
 - 0.0315 mm to 11.684 mm.
147. Calender is a machine in which material is passed through rollers under pressure to
- pulverise it
 - reduce size
 - impart the desired finish or to ensure uniform thickness
 - produce knurlings
 - straighten the sheets.
148. Caterpillar refers to
- road wheels replaced by endless articulated steel bands of flat plates, or by chains, passing round two or more wheels to enable a vehicle to cope with rough and uneven ground
 - a pillar in the centre of a monument
 - material handling equipment in workshops
 - a device to carry molten steel ladles in steel plant
 - a machine tool for planing large castings.
149. A crowned pulley is one which has
- slot in the centre
 - flanges at ends
 - high weight to act as flywheel also
 - convex circumferential surface to prevent lateral movement of the belt which drives it
 - biggest radius out of all the pulleys used in the system.
150. Detent is a
- catch or checking device, the removal of which allows machinery to work
 - tool for crimping operation
 - sort of cam

- (d) device used in belt and pulleys
(e) measuring device.
151. Dither mechanism is a mechanism to
(a) take care of backlash
(b) ensure tight closing
(c) remove striction by providing an oscillatory motion of small amplitude between two relatively moving parts
(d) ensure uniform wear between two mating parts
(e) minimise vibrations.
152. Dividing head is concerned with
(a) marking or engraving accurate subdivisions on scale
(b) accurate linear measurement
(c) milling machines
(d) shapers and planers
(e) steam engines.
153. The speciality of herring-bone gear is that
(a) wear of teeth is uniform
(b) axial thrust is eliminated
(c) it permits rotation in one direction only
(d) all its teeth are of uniform strength
(e) high reduction ratio of more than 40 is possible.
154. Draft tube is concerned with
(a) measurement of flow
(b) carrying water to turbine
(c) increasing efficiency of hydraulic turbine
(d) boilers
(e) steam turbines and gas turbines.
155. A dresser is a tool used for
(a) sharpening cutting tools
(b) producing knurling
(c) threading
(d) truing grinding wheels
(e) superfinishing of metals.
156. Jigger is a
(a) hydraulic lift operated by a short-stroke hydraulic ram through a system of ropes and pulleys which increase the travel
(b) a weaving machine for operating the shedding and controlling the figuring of a large number of warps in a loom
(c) type of crane
(d) device to hold work in jigs
(e) device to prevent relative movement.
157. Michell bearing is one in which

- (a) pivoted pads support the thrust collar or journal and tilt slightly under the wedging action of the lubricant induced by their relative motion
(b) roller bearing is used for taking up thrust
(c) plummer block is employed
(d) recirculating balls are used in clearances
(e) self aligning balls are incorporated.
158. Mitre gear is pair of bevel gear wheels in mesh having their shafts at
(a) inclined position
(b) 45° to each other
(c) right angles
(d) 135° to each other
(e) none of the above.

159. The characteristics shown in Fig. 24 are for

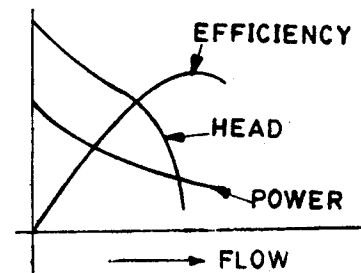


Fig. 24

- (a) centrifugal pump
(b) centrifugal pump with diffuser or volute casing
(c) mixed flow pump
(d) axial flow pump
(e) none of the above.
160. A necessary precaution in selection of pumps for parallel operation is that
(a) H-Q characteristics of both should be identical
(b) there should not be a change from positive to negative slope in H-Q curve
(c) both pumps should be identical
(d) both pumps should be centrifugal type
(e) pumps should not be subjected to cavitation.
161. Fig. 25 shows the relationship of η (efficiency) versus power specific speed for three types of hydraulic turbines. Curves A, B, and C are respectively for
(a) Pelton, Propeller, Francis
(b) Francis, Propeller, Pelton

- (d) attaching a cost value to every function fulfilled by a part in a product
- (e) none of the above.

169. Fibre glass-reinforced plastics are composed of
- (a) reinforcing fibres, a polymer resin matrix, and various additives
 - (b) speciality elastomers
 - (c) glass fibre and concrete
 - (d) glass fibre and thermo plastics
 - (e) polyesters and toughened glass.
170. For items like chemical tanks, pressure vessels, etc. made of reinforced fibre glass plastic, the best suited fabrication process is
- (a) resin transfer moulding
 - (b) compression moulding
 - (c) injection moulding
 - (d) cold stamping
 - (e) filament winding.
171. Linear programming is a mathematical technique which permits determination of the
- (a) best use which can be made of available sources
 - (b) capital expenditure decision
 - (c) break-even analysis
 - (d) wage administration
 - (e) organisation structure.
172. The MAPI (Machinery and Allied Products Institute) formulae are used to determine
- (a) whether equipment should be replaced
 - (b) depreciation calculation
 - (c) economy in the utilization of personnel
 - (d) bases for comparison of alternatives
 - (e) evaluation of existing and proposed operations.
173. A laminate is a product made by
- (a) bonding together two or more layers of material/materials
 - (b) organic compounds
 - (c) using wood based material
 - (d) organic protective coatings
 - (e) using cement.
174. The sectional representation and the appropriate symbol for various welded joints

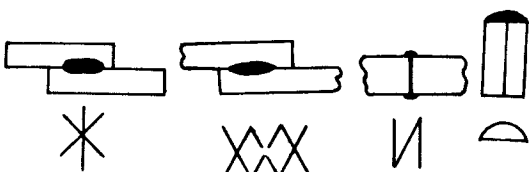


Fig. 27

shown in Fig. 27 are for the following form of welds

- (a) bead, flash, spot, seam
 - (b) seam, spot, seam, flash
 - (c) seam, spot, flash, bead
 - (d) spot, seam, flash, bead
 - (e) spot, flash, seam, bead
175. The lubricant commonly used in press forming low carbon sheet steel is
- (a) water or oil base lubricant
 - (b) fatty oils and blends
 - (c) mixture of graphite and oil
 - (d) graphite
 - (e) mineral oil.
176. The angles θ and α in Fig. 28 are

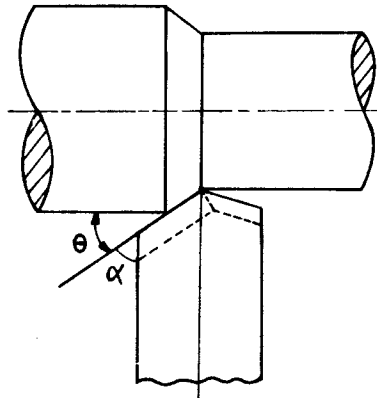


Fig. 28

- (a) principal cutting edge angle and end cutting edge angle
 - (b) side rake angle and side cutting edge angle
 - (c) normal rake angle and orthogonal rake angle
 - (d) principal cutting edge angle and side cutting edge angle
 - (e) back rake angle and end cutting edge angle.
177. The back rake angle and side rake angle of HSS single point tool for machining materials like bakelite and hard copper alloys are
- (a) $15^\circ, 10^\circ$
 - (b) $7^\circ, 2^\circ$
 - (c) $0^\circ, -2^\circ$
 - (d) $0^\circ, 0^\circ$
 - (e) $-5^\circ, -10^\circ$.
178. The thickness of sheets in mm for 14 SWG and 19 SWG are

- (a) 2.95 mm and 1.83 mm
(b) 2.03 mm and 1.02 mm
(c) 1.63 mm and 0.71 mm
(c) 1.42 mm and 0.61 mm
(e) 1.22 mm and 0.38 mm.
179. The ratio of moment of inertia of a triangle and that of a rectangle, having same base and height about their bases, is
(a) 1 (b) 2
(c) 3 (d) 4
(e) 6.
180. The ratio of moment of inertia of a circle and a square having same area about their centroidal X-axis, is
(a) $\frac{\pi}{2}$ (b) $\frac{2}{\pi}$
(c) $\frac{3}{\pi}$ (d) $\frac{\pi}{3}$
(e) $\frac{4}{\pi}$