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06EME14/24

First/Second Semester B.E. Degree Examination, December 2010
Elements of Mechanical Engineering

Time: 3 hrs. Max. Marks:100

Note: *1.Answer any FIVE full questions, choosing at least two from each part.*
2.Answer all objective type questions only in OMR sheet page 5 of the Answer Booklet.
3.Answer to objective type questions on sheets other than OMR will not be valued.

PART – A

1 a. Choose the correct answer :

i) Photosynthesis process which is the source of all fossil fuels and food is called_____.
A) Helio electrical process B) Helio chemical process
C) Helio thermal process D) None of these.

ii) The difference between superheated temperature and the saturation temperature is defined as
A) Sensible heat B) Latent heat
C) Amount of superheat D) Degree of superheat.

iii) _____ is an accessory of a boiler.
A) Pressure gauge B) Safety valve
C) Economizer D) Feed check valve.

iv) Example of a water tube boiler is
A) Babcock and Wilcox boiler B) Lancashire boiler
C) Cornish boiler D) Cochran boiler. **(04 Marks)**

b. 5kg of wet steam of dryness fraction 0.8, passes from a boiler to a superheater, at a constant pressure of 10 bar abs. In the superheater its temperature increases to 350°C. Determine its amount of heat supplied in the superheater. The specific heat of superheated steam C_{ps} = 2.25 kJ/kg K.
[At P = 10 bar abs, the properties from steam tables are :
T_s = 179.88°C h_f = 762.61 kJ/kg h_{fg} = 2013.6 kJ/kg. **(06 Marks)**

c. Explain with a neat sketch, the working principle of a Babcock and Wilcox boiler. **(10 Marks)**

2 a. Choose the correct answer :

i) _____ turbine is an example for steam turbine.
A) Kaplan turbine B) Pelton wheel
C) Francis turbine D) Parson's turbine.

ii) Impulse steam turbines have _____ type of blades.
A) Symmetrical profile B) Aerofoil profile
C) Unsymmetrical profile D) None of these.

iii) In Pelton wheel _____ energy is converted into mechanical energy.
A) Electrical B) Solar
C) Hydraulic D) Wind

iv) _____ is an example for reaction turbine.
A) Kaplan turbine B) Pelton wheel
C) De Lavel turbine D) Curtis turbine. **(04 Marks)**

b. Explain with neat sketches, the working principles of impulse and reaction turbines. **(10 Marks)**

c. What is compounding of a steam turbine? Briefly explain the velocity compounding of a steam turbine. **(06 Marks)**

3 a. Choose the correct answer :

i) A petrol engine works on ____ thermodynamic cycle.
A) Otto cycle B) Diesel cycle
C) Dual combustion cycle D) Sterling cycle.

ii) In 4-stroke engines, number of rotations of the crankshaft to complete a cycle are
A) 1 B) 2
C) 4 D) 6

iii) The part of the engine, which stores energy during power stroke and supply the same for the other three strokes is
A) Piston B) Crank
C) Connecting rod D) Flywheel.

iv) In diesel engines, heat is supplied at constant
A) Temperature B) Pressure
C) Volume D) Area. **(04 Marks)**

b. With a neat sketch, explain the working principle of a four stroke diesel engine, with the PV diagram. **(10 Marks)**

c. A single cylinder four stroke engine runs at 1000 rpm has a bore of 115 mm and has a stroke of 140 mm. The brake load is 6 kg at 600 mm radius and the mechanical efficiency is 80%. Calculate brake power and the mean effective pressure. **(06 Marks)**

4 a. Choose the correct answer :

i) Which one of the following is not used as a refrigerant?
A) Freon – 22 B) Hydrogen
C) Ammonia D) Sulphur dioxide.

ii) In a refrigeration system, the ratio of heat absorbed in a system to the work supplied is called_____
A) Efficiency B) Effectiveness
C) Coefficient of performance D) None of these.

iii) In a vapour absorption refrigerator, the absorber contains,
A) Ammonia B) Cold water
C) Carbon dioxide D) Methyl chloride.

iv) Presence of moisture in a refrigeration cycle will show its effect at
A) Compressor suction B) Compressor discharge
C) Expansion valve D) Condenser. **(04 Marks)**

b. What are the properties of a good refrigerant? Explain. **(06 Marks)**

c. Explain with a neat sketch, the working of a vapour compression refrigerator. **(10 Marks)**

PART – B

5 a. Choose the correct answer :

i) Carriage is a part of a
A) Milling machine B) Drilling machine
C) Grinding machine D) Lathe.

ii) Enlarging of a drilled hole, using a single point cutting tool in a drilling machine, is called _____
A) Drilling B) Counter boring
C) Boring D) Tapping.

iii) The machining operation performed on a lathe, to obtain a flat surface, at the end of the work piece is called
A) Turning B) Facing
C) Knurling D) Taper turning.

iv) Tapping operation is performed to obtain
A) External threads B) Internal threads
C) Tapered hole D) Cylindrical hole. **(04 Marks)**

b. With a neat sketch, explain the following machining operations :
   i) Counter boring
   ii) Knurling
   iii) Taper turning **(09 Marks)**

c. With a neat sketch, explain the construction and working of a radial drilling machine. **(07 Marks)**

6 a. Choose the correct answer :
   i) Regulating wheel is used in _____ operation.
      A) Surface grinding B) Centre type cylindrical grinding
      C) Centreless grinding D) None of these.
   ii) Which one is not an abrasive particle?
      A) Aluminum oxide B) Diamond
      C) Corundum D) Silicate.
   iii) Knee is a part of a
      A) Horizontal milling machine B) Lathe
      C) Radial arm drilling machine D) None of these.
   iv) The process of milling used to mill slots, pockets and keyways, in such a way, that, the axis of the milling cutter is perpendicular to the surface of the workpiece is called___
      A) Straddle milling B) Angular milling
      C) End milling D) Gang milling. **(04 Marks)**

b. Explain the following milling operations, with a neat sketch :
   i) Gang milling
   ii) Straddle milling
   iii) Form milling. **(09 Marks)**

c. With a neat sketch, explain the external cylindrical centerless grinding process. **(07 Marks)**

7 a. Choose the correct answer :
   i) The oxy – acetylene flame, which contains more amount of oxygen and less amount of acetylene is
      A) Neutral flame B) Reducing flame
      C) Oxidizing flame D) None of these.
   ii) Joining of two thin metal pieces using an alloy by the application of heat is called
      A) Soldering B) Welding
      C) Brazing D) Buffing.
   iii) The lubrication method, used in I.C. engines to lubricate the cylinder and the piston is
      A) Splash lubrication B) Drop feed lubrication
      C) Syphon wick lubrication D) None of these.
   iv) Ball bearings are also called as
      A) Thrust bearings B) Journal bearings
      C) Antifriction bearings D) None of these. **(04 Marks)**

b. What are the desirable properties of a good lubricant? Explain any six. **(06 Marks)**

c. With a neat sketch, explain the working principle of oxy – acetylene gas welding. **(06 Marks)**

d. List any four differences between soldering and brazing. **(04 Marks)**

8 a. Choose the correct answer :

i) Power transmitted is
   A) The rate of work done per unit time
   B) The product of force and distance traveled
   C) The energy emitted by any machine or engine
   D) None of these.

ii) Open belt drive is employed when
   A) Two parallel shafts are rotating in the some direction
   B) Two parallel shafts are rotating in the opposite direction
   C) Two perpendicular shafts are rotating in the same direction
   D) Two perpendicular shafts are rotating in the opposite direction.

iii) Gears, used for connecting non – parallel and non intersecting axes shafts are
   A) Spur gears B) Bevel gears
   C) Worm gears D) Spiral gears.

iv) Gear drive used to convert the rotary motion into linear motion is
   A) Spur gear B) Bevel gear
   C) Rack and pinion D) Spiral gear. **(04 Marks)**

b. With neat sketches, explain the following terms, used in belt drives :
   i) Arc of contact
   ii) Tight and slack sides
   iii) Velocity ratio. **(09 Marks)**

c. Two spur gears A and B connect two parallel shafts, that are 500 mm apart. Gear 'A' runs at 400 rpm and gear 'B' at 200 rpm. If the circular pitch is 30mm, calculate the number of teeth on gears A and B. **(07 Marks)**

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10EME14

First Semester B.E. Degree Examination, January 2011
Elements of Mechanical Engineering

Time: 3 hrs. Max. Marks:100

Note: 1. ***Answer any FIVE full questions, choosing at least two from each part.***
2. ***Answer all objective type questions only on OMR sheet page 5 of the answer booklet.***
3. ***Answer to objective type questions on sheets other than OMR will not be valued.***
4. ***Use of steam tables is not permitted.***

PART – A

1 a. Choose the correct answer :

i) In which case, the potential energy is converted into the mechanical energy
A) Hydel energy B) Solar energy C) Wind energy D) Nuclear energy

ii) The flow of steam inside the boiler is regulated by
A) Feed check valve B) Blow off cock C) Safety valve D) Stop valve.

iii) Enthalpy of wet steam is determined by (with usual notations)
A) $h_g = h_f + h_{fg}$ kJ/kg B) $h = h_f + x.h_{fg}$ kJ/kg
C) $h_{sup} = h_g + c_{ps}(T_{sup} - T_s)$ kJ/kg D) $x = m_g / (m_f + m_g)$

iv) Boiler accessories are fitted
A) To measure steam properties B) To control steam inside the boiler
C) To improve the efficiency of the boiler D) None of these. **(04 Marks)**

b. With the help of simple line diagrams, show how solar energy, wind energy, hydel energy and tidal energy can be used as energy sources. **(08 Marks)**

c. List the various boiler mountings and accessories. **(03 Marks)**

d. Find the enthalpy of 1 kg of steam at 12 bar when steam is (i) dry saturated (ii) 22% wet and (iii) superheated to 250°C. Assume at 12 bar, steam has the following values: $T_s = 188°C$, $h_f = 798.43$ kJ/kg, $h_{fg} = 1984.3$ kJ/kg, specific heat of the superheated steam is 2.25 kJ/kg. **(05 Marks)**

2 a. Choose the correct answer :

i) The pipe which carries water from the reservoir to the turbine is called as
A) Tailrace B) Penstock C) Headrace D) Surge tank

ii) The pressure energy of steam is converted into the kinetic energy by
A) Blades B) Rotor C) Nozzles D) Draft tube.

iii) Method of reducing the rotor speed is known as
A) Supercharging B) Retardation C) Governing D) Compounding

iv) Flow of water through the runner, parallel to the axis of rotation of runner is known as
A) Tangential flow B) Radial flow C) Axial flow D) Mixed flow. **(04 Marks)**

b. Distinguish between the impulse and reaction turbines. **(08 Marks)**

c. List the important parts of a Pelton wheel and explain their functions. **(08 Marks)**

3 a. Choose the correct answer :

i) A connecting rod is a link between
A) Piston and the crankshaft B) Piston and the flywheel
C) Cylinder and the flywheel D) None of these.

ii) A diesel engine is
A) spark ignition engine B) compression ignition engine
C) external combustion engine D) None of these.

iii) The power developed inside the engine is called as
A) BHP B) FHP C) IHP D) MEP

iv) The function of a carburetor is to
A) provide air-fuel mixture B) supply pure air
C) supply fuel only D) cool the engine. **(04 Marks)**

b. With the help of a line diagram, explain the working of a four stroke petrol engine. **(08 Marks)**

c. The following observations were recorded during a test on a four stroke engine:
Bore = 25cm ; Stroke = 40 cm ; Crank speed = 250 rpm;
Net load on the brake drum = 700N ; Diameter of brake drum = 2m ;
Indicated mean effective pressure = 6 bar.
Determine : i) BP ii) IP iii) FP iv) Mechanical efficiency. **(08 Marks)**

4 a. Choose the correct answer :

i) The chilling or freezing unit of a refrigerator is called as
A) Compressor B) Evaporator C) Condenser D) Carburettor.

ii) Ratio of heat removed from a cold body to the work input is known as
A) Ton of refrigeration B) Coefficient of performance
C) Relative coefficient of performance D) Refrigeration effect.

iii) The function of an absorber is to
A) separate the vapour B) raise the pressure of the vapour
C) absorb the refrigerant vapour D) None of these.

iv) One ton of refrigeration is equal to
A) 1.5 kW B) 2.5 kW C) 3.5 kW D) 4.5 kW. **(04 Marks)**

b. Explain the following terms:
i) Refrigerant ii) Refrigerating effect
iii) Ton of refrigeration iv) Coefficient of performance. **(08 Marks)**

c. Distinguish between the vapour compression and vapour absorption refrigeration. **(08 Marks)**

PART – B

5 a. Choose the correct answer :

i) Which part of the lathe is engaged for thread cutting operation?
A) Lead screw B) Saddle C) Cross slide D) Apron

ii) Enlarging the existing hole to the required diameter is done by
A) drilling B) boring C) knurling D) turning

iii) The tailstock setover is related to
A) thread cutting B) plane turning C) taper turning D) knurling

iv) The helical groove on the twist drill bit is called as
A) flank B) shank C) tang D) flute. **(04 Marks)**

b. With the help of a sketch, indicate the specifications of a lathe. **(08 Marks)**

c. Sketch a radial drilling machine and explain its working. **(08 Marks)**

6 a. Choose the correct answer :

i) The milling cutter is mounted on the
A) saddle B) arbor C) column D) knee

ii) When the rotating cutter is fed against the advancing workpiece, it is called as
A) slab milling B) angular milling C) climb milling D) upmilling

iii) Removal of material by the mechanical action of abrasive particles is called as
A) slot milling B) grinding C) reaming D) tapping.

iv) Finishing the external cylindrical surface is carried out by
A) Lapping B) Honing C) Centreless grinding D) Angular milling. **(04 Marks)**

b. Sketch the following operations:
i) Upmilling ii) Down milling iii) Slot milling iv) Surface grinding. **(08 Marks)**

c. Explain the various abrasive materials used in the grinding operations. **(04 Marks)**

d. List the important specifications of an universal milling machine. **(04 Marks)**

7 a. Choose the correct answer :

i) Excess amount of acetylene is used for producing
A) Oxidizing flame B) Neutral flame C) Carburizing flame D) None of these.

ii) The melting point of a filler material in brazing is
A) Below 100°C B) 150°C to 400°C C) 450°C to 900°C D) 1000°C to 3000°C

iii) When the load is applied perpendicular to the axis of the shaft, the best choice to select
A) pivot bearing B) journal bearing C) bushed bearing D) thrust bearing

iv) The temperature at which the lubricating oil will cease to flow is known as
A) pour point B) cloud point C) flash point D) fire point. **(04 Marks)**

b. List the important properties of a good lubricant. **(06 Marks)**

c. Sketch the full pressure lubrication system. **(05 Marks)**

d. Explain the wick feed lubrication system. **(05 Marks)**

8 a. Choose the correct answer :

i) Suggest a pulley when a machine needs to be stopped and started intermittently.
A) Stepped cone pulley B) Jockey pulley
C) Fast and loose pulley D) Guide pulley.

ii) Sliding of belt between the pulley and the belt is called
A) creep B) slip C) tension D) pull.

iii) The preferred drive, when the centre distance is short
A) Chain drive B) Belt drive C) Rope drive D) Gear drive

iv) Drive used to convert a rotary motion into a linear motion is
A) helical gear B) bevel gear C) rack & pinion D) worm gear. **(04 Marks)**

b. Sketch and explain :
i) Open and cross belt drives ii) Stepped cone pulley. **(08 Marks)**

c. Classify the various types of gear drives and mention their uses. **(04 Marks)**

d. List the advantages of a V-belt over a flat belt. **(04 Marks)**

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