USN 1BI09IM038

First/Second Semester B.E. Degree Examination, Dec.09/Jan.10
Elements of Mechanical Engineering

Time: 3 hrs. Max. Marks:100

Note: *1. Answer any FIVE full questions, selecting at least TWO questions from each part.*
2. Answer all objectives type questions only on the OMR sheet, page 5 of the answer booklet.
3. Answer for objective type questions written on pages other than OMR sheet (page 5) will not be valued.
4. Use of steam table is not permitted.

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

PART – A

1 a. Choose the correct answer:

i) If the specific volume of superheated steam is υ_{sup}, specific volume of dry saturated steam at same constant pressure 'P' is υ_g, saturation temperature at same pressure 'P' is T_s, and superheated temperature at 'P' is T_{sup}, then υ_{sup} is

A) $\upsilon_g \cdot \frac{T_s}{T_{sup}}$ B) $\upsilon_g \cdot \frac{T_{sup}}{T_s}$

C) $\upsilon_g (T_{sup} - T_s)$ D) $\upsilon_g (T_{sup} + T_s)$

ii) Blow off valve is used
A) To reduce steam pressure
B) To stop steam supply
C) To remove sediments collected at the bottom of the boiler
D) To remove excess steam from boiler

iii) Super heater is used
A) Inside the boiler drum
B) To convert wet steam into dry steam
C) In the path of flue gases to increase volume of steam
D) To increase temperature of steam above saturation temperature.

iv) Economisers ared used to:
A) Conserve water
B) To absorb heat from exit gases by feed water
C) To improve combustion of fuel
D) To convert water into steam. **(04 Marks)**

b. Name three renewable and nonrenewable energy sources and compare them for merits and demerits. **(08 Marks)**

c. Find the enthalpy of 1 kg. of steam at 10 bar absolute, when the steam is
i) Dry saturated
ii) 20% wet
iii) Super heated to 220°C. Assume specific heat of superheated steam as 2.25 kJ/kg K.
Take the following data for the steam at 10 bar: **(04 Marks)**

t_s	h_f	h_{fg}	h_g
180°C	762	2030	2792 kJ/kg.

d. Sketch a Lancashire boiler and name its parts (front view only). **(04 Marks)**

2 a. Choose the correct answer:

i) Kaplan turbine is
A) Impulse water turbine B) Steam turbine
C) Gas turbine D) Axial flow water turbine

ii) Pelton turbine is
A) A reaction turbine B) Tangential flow turbine
C) Mixed flow turbine D) A steam turbine

iii) A prime mover, which converts heat energy of steam into mechanical energy diretly in the form of rotary motion is called
A) Steam engine B) I.C. engine
C) Steam turbine D) Generator

iv) Most efficient prime mover is
A) I.C. engine B) Gas turbine
C) Steam engine D) Steam turbine. **(04 Marks)**

b. Sketch and explain the working of a Pelton turbine. **(08 Marks)**

c. Draw a constant pressure open cycle gas turbine diagram and explain its working. **(08 Marks)**

3 a. Choose the correct answer:

i) In 2 – stroke engine, power is developed
A) In every revolution B) Once in 2 revolutions
C) At half the revolution D) In every stroke

ii) In diesel engine, during suction stroke ..... is sucked in the cylinder
A) Air – fuel mixture B) Fuel – air mixture
C) Air D) Diesel

iii) Scavenging is employed in
A) 4 – stroke petrol engine B) 4 – stroke diesel engine
C) 2 – stroke petrol or diesel engine D) IN all types of engines.

iv) Fly wheel is used
A) To increase speed B) To reduce fuel consumption
C) To make speed uniform D) To increase torque. **(04 Marks)**

b. Explain working and construction of 4 – stroke diesel engine with the help of theoretical p – υ diagram. **(08 Marks)**

c. Following data are collected from a 4 – stroke single cylinder oil engine at full load. Bore = 200 mm, stroke = 280 mm, speed = 300 RPM. Indicated mean effective pressure = 5.6 bar, torque on the brake drum = 250 N.m. Oil consumed 4.2 kg/hour. Calorific value of oil 41,000 kJ/kg. Determine mechanical efficiency, indicated thermal efficiency and brake thermal efficiency. **(08 Marks)**

4 a. Choose the correct answer:

i) Condenser is used in a refrigerator
A) To compress the refrigerant B) To expand the vapour
C) To absorb the heat from refrigerant D) To transform into vapour.

ii) The name of the refrigerant, commonly used in domestic refrigerator, is
A) Water B) Freon – 12
C) Carbon D) Ice

iii) One ton of refrigeration is equal to ..... kJ/sec
A) 3.5 B) 5.00
C) 1.55 D) 50

iv) As a property of a good refrigerant, it should have
A) Low saturation point B) High saturation point
C) Low thermal conductivity D) Low enthalpy of evaporation. **(04 Marks)**

b. Name the various parts of a vapour compression refrigerator and briefly explain with a flow diagram their functions. **(08 Marks)**

c. Explain the construction and working of a room air conditioner. **(08 Marks)**

PART – B

5 a. Choose the correct answer:
i) Reaming is the process of
A) Enlarging a drilled hole B) Finishing a drilled hole
C) Operation done on lathe D) Operation after facing
ii) ..... is the name of the part to hold a cylindrical work piece in the lathe
A) Tailstock B) Tool post
C) 3 – JAW chuck D) Head stock
iii) In radial drilling machine..... is moved for drilling operation
A) Column B) Table
C) Arm D) Handle
iv) ..... is the operation of embossing a diamond shaped pattern on the surface of a work piece on lathe
A) Taper turning B) Knurling
C) Eccentric turning D) Engraving. **(04 Marks)**

b. Explain the functions of various important parts of a centre lathe with a neat sketch. **(08 Marks)**

c. Explain with the help of sketches four machining operations that can be carried out in a drilling machine. **(08 Marks)**

6 a. Choose the correct answer:
i) ..... is the abrasive material used in grinding wheels
A) Aluminium chloride B) Calcium carbonate
C) Silicon carbide D) Tungsten carbide
ii) Grinding is also known as
A) Lapping B) Honing
C) Abrasive machining D) Reaming.
iii) ..... is known as natural abrasive
A) Granite B) Magnetite
C) Corundum D) Ferrite
iv) Milling cutter is mounted on
A) Column B) Spindle
C) Arbor D) Shaft. **(04 Marks)**

b. Draw a neat sketch of a horizontal milling machine and explain various milling operations on the machine. **(08 Marks)**

c. Sketch a plain centre type cylindrical grinding machine and explain the working of the machine. **(08 Marks)**

7 a. Choose the correct answer:

i) Spelter is used in ..... for joining dissimilar metals with the help of heating'

A) Arc welding B) Soldering

C) Brazing D) Forge welding

ii) ..... is the important property of a lubricant

A) Low fire point B) High viscosity

C) Lightness D) To be volatile

iii) Plummer block is a name of

A) Horizontal bearing B) Vertical bearing

C) Roller bearing D) Collar bearing

iv) Bearing material is made of

A) Mild steel B) Tin

C) Zinc D) Bronze. **(04 Marks)**

b. Sketch a ball bearing, name the parts and explain their function. **(04 Marks)**

c. Sketch a wick feed lubricator and explain its working. **(04 Marks)**

d. What are antifriction bearings? State advantages and disadvantages of them over other types of bearings. **(08 Marks)**

8 a. Choose the correct answer:

i) ..... is used to transmit power between two perpendicular shafts

A) Spur gear B) Helical gear

C) Herringbone gear D) Bevel gear

ii) ..... is used to convert rotary motion to linear motion

A) Spur gear B) Rack and pinion

C) Helical gear D) Worm and worm gear

iii) To stop the machine temporarily in a belt drive, ... is used

A) Guide pulley B) Stepped cone pulley

C) Jockey pulley D) Fast and loose pulley

iv) In an open belt drive, ratio of pulley diameters is equal to

A) Inverse of speed ratio B) Speed ratio

C) Ratio of tensions D) None of these. **(04 Marks)**

b. Derive an expression for length of belt in open belt drive. **(08 Marks)**

c. A gear train consists of four gears A, B, C and D of 20, 25, 50 and 75 teeth respectively. A meshes with C and B is a compound gear with C. B meshes with D. If A has a speed of 300 RPM what is the speed of D? Sketch the gear train. **(08 Marks)**

* * * * *