Total No. of Questions—8]   [Total No. of Printed Pages—4

Seat
No.

[4856]-205

F.E. EXAMINATION, 2015
BASIC MECHANICAL ENGINEERING
(2012 PATTERN)

Time : Two Hours   **Maximum Marks : 50**

N.B. :— (*i*) Assume suitable data, if necessary.

    (*ii*) Figures to the right indicate full marks.

    (*iii*) Neat diagrams must be drawn wherever necessary.

    (*iv*) Use of non-programmable electronic calculator is permitted.

    (*v*) Attempt *four* questions out of eight, Q. No. **1** *or* Q. No. **2**, Q. No. **3** *or* Q. No. **4**, Q. No. **5** *or* Q. No. **6**, Q. No. **7** *or* Q. No. **8**.

1. (*a*) Explain the following machine elements :   [6]

    (*i*) Axle and shaft

    (*ii*) Parallel key

    (*iii*) V belt drive.

  (*b*) Define mechanism, machine and state their examples. Explain the mechanism used in single stage, single acting, reciprocating air compressor with neat sketch.   [6]

Or

2. (*a*) Explain working of disc brake with schematic (simple) sketch.   [4]

P.T.O.

(*b*) Explain any *four* mechanical properties of engineering material. [4]

(*c*) How are engineering materials classified ? Write a short note on plain carbon steel. [4]

3. (*a*) Explain hot forging process with neat sketch. [4]

(*b*) Draw a labelled block diagram of lathe machine. [4]

(*c*) Identify and explain suitable manufacturing process to impart smooth surface finish and dimensional accuracy to piston pins, balls and rollers of rolling contact bearing etc. [4]

Or

4. (*a*) Draw self-explanatory sketches of various sheet metal forming processes. [4]

(*b*) Identify and explain suitable manufacturing process to join two mild steel plates. [4]

(*c*) Explain drilling operation performed on lathe machine and radial drilling machine. [4]

5. (*a*) Explain the following terms : [4]

(*i*) Zeroth law of thermodynamics

(*ii*) Extensive properties

(*iii*) Closed system

(*iv*) Heat engine.

(*b*) Explain measurement of pressure using simple U-tube manometer. [4]

(c) A heat pump is used to maintain the house at 24 degree C. The house is losing the heat at the rate of 1800 kJ/min to the surrounding. The heat pump is driven by an electric motor of power rating 12 kW. Find : [5]

(i) The amount of heat absorbed from surrounding

(ii) COP of the heat pump

Draw the sketch of the system.

Or

6. (a) The pressure of gas flowing through a pipe is to be measured with simple U-tube mercury manometer. Left arm of the U-tube is connected to gas pipe while right arm is open to atmosphere. Calculate the absolute pressure of the gas when the level of mercury, in the arm open to atmosphere is : [6]

Case (A) 300 mm higher than the level of mercury in left arm and

Case (B) 200 mm lower than the level of mercury in left arm.

Draw sketch of the system for Case (A) and Case (B).

Given :

Atmospheric pressure = 10 m of water column

Acceleration due to gravity = 9.81 m/sec^2

Density of mercury = 13600 kg/m^3.

(b) Explain "Kelvin-Planck and Clausius" statement of second law of thermodynamics. [4]

(c) Draw a sketch of Heat Pump and Refrigerator uisng Heat Source and Sink concept. [3]

Prove that :

$$(COP)_{Heat\ Pump} = 1 + (COP)_{Refrigerator}$$

7. (*a*) Draw a layout of solar power plant. State the limitations of the plant. [4]

(*b*) Explain classification of boilers in brief. [4]

(*c*) What do you mean by air-conditioning ? Draw a neat sketch of window air-conditioning system. Show the direction of hot and cool air-flow. [5]

Or

8. (*a*) Draw a layout of hydro-electric power plant and explain the energy extraction (energy conversion) process. [4]

(*b*) Differentiate between Impulse turbine and Reaction turbine (**4** points). [4]

(*c*) Explain working of reciprocating pump with neat diagram and state its application. [5]