

Total No. of Questions : 12]

SEAT No. :

P551

[Total No. of Pages : 3

[4456] - 11

F.E. (Semester - II)

BASIC MECHANICAL ENGINEERING

(2008 Course)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) Solve Q.1 or Q.2, Q.3 or Q.4 and Q.5 or Q.6 from Section - I.
- 2) Solve Q.7 or Q.8, Q.9 or Q.10 and Q.11 or Q.12 from Section - II.
- 3) Solve Section - I and II on separate answer sheets.

**SECTION - I**

- Q1)** a) Define Thermodynamic work and represent isothermal, constant pressure and polytropic process on P-V diagram. [2 × 4]
- b) Draw schematic of refrigerator and heat pump and write the efficiency/cop expressions. [4 + 4]

OR

- Q2)** a) State 1<sup>st</sup> law of thermodynamics and write the limitations of 1<sup>st</sup> law. Write the 1<sup>st</sup> law equation. [2 + 4 + 2]
- b) 0.3 kg of nitrogen gas at 100kPa and 40°C is contained in a cylinder. The piston is moved compressing nitrogen until the pressure becomes 1 MPa and temperature becomes 160°C. The work done during the process is 30kJ. Calculate the change in internal energy and heat transfer from the nitrogen to the surroundings.  
 $C_v$  for nitrogen = 0.75 kJ/kg K. [4 + 4]

- Q3)** a) Draw neat sketches and explain working of Double acting Reciprocating pump write applications of the same. [3 + 3 + 2]
- b) Explain the working of household refrigerator with VCC sketch. [4 + 4]

OR

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**Q4)** a) Explain working of reciprocating air compressor with neat sketch and list any four applications. [3 + 3 + 2]

b) Explain the working of Gas turbine with neat sketch. [4 + 4]

**Q5)** a) Explain Solar - Wind Hybrid Power Plant with neat sketch. [4 + 4]

b) Derive the expressions for Thermal resistance in series and parallel. [4 + 4]

c) State four examples of Conducting material. [2]

OR

**Q6)** a) Explain Thermal Power plant with neat sketch. [4 + 4]

b) Hot air at a temperature of  $65^{\circ}\text{C}$  is flowing through a steel pipe of 120mm diameter. The pipe is covered with two layers of different insulating materials of thickness 60mm and 40mm, and their corresponding thermal conductivities are 0.24 and 0.4  $\text{W/m}^{\circ}\text{C}$ . The inside and outside heat transfer coefficients are 60 and 12  $\text{W/m}^2\text{C}$ . The atmosphere is at  $20^{\circ}\text{C}$ . Find the rate of heat loss from 60m length of pipe. [8]

c) State Newton's law of cooling. [2]

### SECTION - II

**Q7)** a) Explain with neat sketch: woodruff key, splines. [4 + 4]

b) Compare sliding contact bearing and rolling contact bearing along with sketch. [4 + 4]

OR

**Q8)** a) What is brake? How the brakes are classified and write its application. [2 + 4 + 2]

b) What is the function of coupling? Explain with a neat sketch any one type of coupling. [2 + 3 + 3]

**Q9)** a) State steps of design process. [8]

b) Explain aesthetics and ergonomics considerations in design. [4 + 4]

OR

- Q10)** a) Explain forging process with sketch and state its applications. [6 + 2]  
b) How engineering materials are classified? [8]

- Q11)** a) Explain any four operations performed on lathe machine with neat sketch. [4 × 2]  
b) Explain the working principal of CNC machine and state its advantages. [4 + 4]  
c) State use of Tailstock in lathe machine. [2]

OR

- Q12)** a) Draw the neat label diagram of Pillar drilling machine and explain its working. [4 + 4]  
b) Explain any four operations performed on milling machine. [4 × 2]  
c) State function of Apron in lathe machine. [2]

