

**24008**

**B. Tech. 1st Semester Examination, December-2012**

**BASICS OF MECHANICAL ENGG.**

**Paper-ME-101-F**

*Time allowed : 3 hours]*

*[Maximum marks : 100*

*Note : Question 1 is compulsory. Attempt any five questions in total by selecting at least one question from each section.*

1.
  - (i) Define critical point and triple point.
  - (ii) What is meant by thermodynamic equilibrium
  - (iii) Define closed and isolated system
  - (iv) Write an expression for COP of a refrigerator
  - (v) Classify different types of pumps
  - (vi) Why is V belt preferred over other forms of mechanical drive ?
  - (vii) Define creep and slip in belts
  - (viii) Define drilling and boring. 8×2.5=20

**Section-A**

2. (a) It is desired to compress 10 kg of gas from  $1.5\text{ m}^3$  to  $0.3\text{ m}^3$  at constant pressure of 15 bar. During this compression process, the temperature rises from  $20^\circ\text{C}$  to  $150^\circ\text{C}$  and increase in internal

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energy is 3250kJ. Calculate the work done, heat interaction and change in enthalpy during the process. Also work out the average value of specific heat at constant pressure. 12

(b) Distinguish between a heat engine, a heat pump and a refrigerator. 8

3. (a) Draw a well labelled neat sketch of a lathe machine and state the functions of its different parts. 14

(b) List the advantages of using superheated steam. 6

#### Section-B

4. (a) Describe, with a neat schematic arrangement, the working of a simple vapour compression refrigeration cycle. Represent the cycle on p-v and T-s plots. 10

(b) Define and explain the following terms : dry bulb temperature, wet bulb and dew point temperatures, relative humidity. 10

5. (a) Draw a neat sketch of a centrifugal pump and explain how does it operates. 10

- (b) Draw an expression for specific speed of hydraulic turbine. Point out how the classification of hydraulic turbines is based on specific speed ? 10

### Section-C

6. (a) An open belt connects two flat pulleys. The smaller pulley is 600 mm in diameter and turns 200 revolutions per minute. The angle of lap on the pulley is  $160^\circ$  and the coefficient of friction between belt and pulley face is 0.25. If maximum permissible tension in belt is 2500 N, calculate the power transmitted by the belt. 12
- (b) Explain briefly the difference between simple, compound and epicyclic gear trains. 8
7. (a) During a tensile test on a mild steel specimen, 40 mm diameter and 200 mm long the following data were obtained :
- Extension at 40 kN load = 0.0304 mm,  
yield load = 161 kN and length of specimen at fracture = 249 mm.
- Determine
- (a) modulus of elasticity  
(b) percentage elongation and  
(c) yield point stress. 12

- (b) Derive a relation for volumetric strain of a rectangular bar subjected to axial force in terms of longitudinal strain and Poisson's ratio. 8

### **Section-D**

8. (a) Explain the difference between open and closed loop system control systems in relation to NC and CNC machine systems. 10
- (b) Draw a neat diagram showing the main elements of a NC machine, and state the function served by each element. 10
9. (a) Write advantages and applications of NC machines. 10
- (b) How a CNC machine differs from a NC machine? Name the main components of a CNC system. 10