

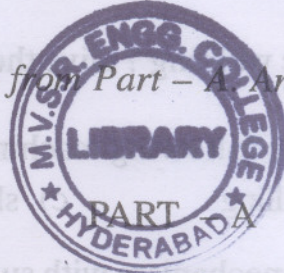
FACULTY OF ENGINEERING

B.E. 2/4 (E & EE/ECE) I Semester (Main) Examination, December 2010
ELEMENTS OF MECHANICAL ENGINEERING

Time: 3 Hours]

[Max. Marks: 75

Note : Answer all questions from Part – A. Answer any five questions from Part – B.



(25 Marks)

1. Give the classification of thermodynamic systems with examples.
2. Compare two stroke and four stroke engines.
3. What is Newton's law of cooling ?
4. Give the classification of heat exchangers.
5. Define C.O.P and give the units of refrigeration.
6. Explain ammonia-water absorption refrigeration system.
7. What are the different types of gas flames in gas welding ?
8. What do you mean by wire drawing process ?
9. What is a compound belt drive ?
10. What do you mean by reverted gear trains ?

PART – B

(5×10=50 Marks)

11. a) Define enthalpy. Compare it with internal energy. 4
- b) 30 liters of air expands from an initial pressure of 8 bar and temperature 850°C to a pressure of 1 bar and temperature 200°C . Using reference temperature 0°C , find the change in internal energy, enthalpy and index of expansion during the process. Assume $C_p = 1.005$ and $C_v = 0.718$ kJ/kg K. 6
12. a) State the Fouriers law of heat conduction.
Calculate the rate of heat loss for a red brick wall of length 5 m, height 4 m and thickness 0.25 m. The temperature of the inner surface is 110°C and that of the outer surface is 40°C . The thermal conductivity of red brick, $k = 0.70$ W/mK. Calculate also the temperature at an interior point of the wall, 20 cm distance from the inner wall. (2+4)
- b) Derive an expression for the LMTD of a parallel flow heat exchanger. 4

13. a) With the help of a block diagram, explain the working of simple vapour compression refrigeration system. Show the cycle on T-S and P-H diagrams. 7
- b) What is heating and humidification process ? Represent it on a psychrometric chart. 3
14. a) Explain the principle of arc welding ? Give the list of equipment required for electric arc welding. 4
- b) Explain the principles of the following machining processes
 a) turning b) drilling c) shaping 6
15. a) Explain the four bar chain mechanism with suitable sketches. 5
- b) Derive an expression for the length of belt in open belt drive. 5
16. a) Draw the value timing diagram of a 4-stroke SI engine. 3
- b) A single cylinder, 4 stroke cycle I.C engine was tested and following results were obtained.
- | | |
|------------------------------------|--------------------------|
| Mean height of indicator diagram = | 21 mm |
| Indicator spring number = | 27 kN/m ² /mm |
| Swept volume of cylinder = | 14 Liters |
| Speed of engine = | 396 rpm |
| Effective brake load = | 77 kg |
| Effective brake radius = | 700 mm |
| Fuel consumption = | 0.002 kg/sec |
| Calorific value of fuel = | 44000 kJ/kg |
- Determine a) indicated power b) brake power c) mechanical efficiency
 d) indicated thermal efficiency e) brake thermal efficiency. 7
17. Write short notes on **any four** of the following : 10
- a) Clausius inequality
- b) Critical radius of insulation
- c) Thermoelectric refrigeration
- d) Forming process
- e) Condition for maximum power transmission of flat belt drive.