

Code: ME6T4

**III B.Tech - II Semester – Regular Examinations – May 2015**

**REFRIGERATION & AIR CONDITIONING  
(MECHANICAL ENGINEERING)**

Duration: 3 hours

Marks: 5x14=70

Answer any FIVE questions. All questions carry equal marks

1. a) Explain with P-V and T-S diagrams, Bell Coleman Cycle used for Refrigeration System. 7 M

b) A dense air refrigeration system of 10 TR capacity works between 5 bar and 17 bar. The air leaves the cold chamber at 0 °C and discharges at 25 °C to the expansion cylinder after air cooler. The expansion and compression cylinders are double acting. The  $\eta_{\text{mech}}$  of compressor and expander are 80 % and 85 % respectively. The speed of the compressor is 300 rpm and has a stroke of 300 mm.

Determine:

7 M

(i) COP      (ii) Power required

(iii) Bore of compression and expander cylinders.

2. a) Explain the effect of suction and discharge pressure on Vapour Compression Refrigeration System. 4 M

- b) A Vapour Compression Refrigeration machine working on R-22 has a capacity of 10TR operating between  $-30^{\circ}\text{C}$  and  $28^{\circ}\text{C}$ . The refrigerant is sub-cooled by  $5^{\circ}\text{C}$  before entering expansion valve and a vapour is superheated by  $4^{\circ}\text{C}$  before leaving the evaporator. The machine has five cylinder double acting compressor with a stroke 1.5 times the bore. It has a clearance of 2% of the stroke volume.  
Determine 10 M
- (i) Theoretical Power,
  - (ii) Bore and stroke of the cylinder
  - (iii)  $\eta_{\text{vol}}$ , if speed is 1200rpm.
3. a) Give the classification of condensers. Explain the difference between Air cooled and Water Cooled Condensers. 5 M
- b) Explain the concept of Fouling Factor in condensers. 4 M
- c) Give the nomenclature of a refrigerant with any four appropriate examples. 5 M
4. a) Derive an expression for COP of Ideal Vapour absorption Refrigeration System. 6 M
- b) With a neat sketch explain the principle, construction and working of an Electrolux Vapour absorption refrigeration system. 8 M

5. a) With a neat sketch, explain the working principle of Thermo-electric refrigeration system. 7 M
- b) Explain the construction features, the working principle of Steam Jet Refrigeration with a neat sketch. 7 M
6. a) Differentiate between Refrigeration and Air conditioning. 4 M
- b) A Psychrometer reads  $44^{\circ}\text{C}$  DBT,  $30^{\circ}\text{C}$  WBT, assuming the total pressure of the mixture to be 1 bar, determine the following properties. 10 M
- (i) Partial pressure of water vapour  
(ii) Specific humidity (iii) Relative humidity  
(iv) Dew Point temperature (v) Enthalpy of mixture
7. a) Explain the term by pass factor. Derive the expression for by pass factor in terms of coil surface temperature, air entry temperature and air exit temperature from the coil. How it is related with contact factor? 6 M
- b) An air-conditioned space is maintained at  $27^{\circ}\text{C}$  DBT and 50% RH. The ambient conditions are  $40^{\circ}\text{C}$  DBT and  $27^{\circ}\text{C}$  WBT the space has a sensible heat gain of 14 kW. Air is supplied to the space of  $7^{\circ}\text{C}$  saturated. Calculate  
(i) mass of moist air supplied to the space in kg/hr.  
(ii) Latent heat gain in kW. 8 M

8. a) Explain with a neat sketch the constructional features of Year round Air conditioning system. 7 M
- b) With a neat sketch explain the working of a heat pump which makes use of Rankine Power cycle. 7 M