

**Th-5 Refrigeration & Air Conditioning**

Full Marks: 80

Time- 3 Hrs

Answer any five Questions including Q No.1& 2  
Figures in the right hand margin indicates marks

1. Answer **All** questions 2 x 10
- a. What do you mean by refrigeration?
  - b. Define 'tonne' of refrigeration.
  - c. Differentiate between primary refrigerant and secondary refrigerant.
  - d. What are the chemical formulae of refrigerant R-11, R-13, R-21 and R-22?
  - e. What are the equipments used in an Air-conditioning system?
  - f. What is the use of Air filter and blower in air conditioning system?
  - g. Define sensible heat factor.
  - h. What is Dry-bulb temperature?
  - i. What are the physical properties of refrigerant?
  - j. Give the classification of evaporators.
2. Answer **Any Six** Questions 6 x 5
- a. Describe chemical properties of refrigerants.
  - b. With the help of neat diagram explain the working of a thermostatic expansion valve.
  - c. Enumerate the desirable properties of an ideal refrigerant.
  - d. With the help of Psychrometric chart, Explain sensible cooling and sensible heating.
  - e. Draw the P-V and T-S diagram for a reversed Brayton cycle and derive the expression for its COP.
  - f. What are the applications of refrigeration? Explain ice plant layout.
  - g. In vapour absorption refrigeration system, heating, cooling and refrigeration take place at the temperatures of 100°C, 20°C and -5° respectively. Find the maximum C.O.P of the system.

- 3 With neat sketch, describe practical vapour absorption refrigeration system. 10
- 4 Explain in details about the summer air conditioning and winter air-conditioning system. 10
- 5 Explain with the help of neat sketch, the principle of operation of a single stage, single acting reciprocating compressor. 10
- 6 In an ammonia vapour compression system, the pressure in the evaporator is 2bar. Ammonia at exit is 0.85 dry and at entry its dryness fraction is 0.19. During compression the work done per kg of ammonia is 150kJ. Calculate the C.O.P. and the volume of vapour entering the compressor per minute. If the rate of ammonia circulation is 4.5kg/min. The latent heat and specific volume at 2bar are 1325kJ/kg and  $0.58\text{m}^3/\text{kg}$  respectively. 10
- 7 In an absorption type refrigerator, the heat is supplied to  $\text{NH}_3$  generator by condensing steam at 2bar and 90% dry. The temperature in the refrigerator is to be maintained at  $-5^\circ\text{C}$ . Find the maximum C.O.P. possible. If the refrigeration load is 20 tonnes and actual C.O.P. is 70% of the maximum C.O.P., Find the mass of steam required per hour. Take temperature of the atmosphere as  $30^\circ\text{C}$ . 10