

Code No: RT32037A

R13

SET - 1

III B. Tech II Semester Supplementary Examinations, November - 2017**REFRIGERATION & AIR CONDITIONING****(Mechanical Engineering)**

Time: 3 hours

Maximum Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B**)

2. Answering the question in **Part-A** is compulsory3. Answer any **THREE** Questions from **Part-B**

(Refrigeration and Psychrometric tables and charts allowed)**PART -A**

- 1 a) Why refrigeration is required in Aircrafts? [3M]
- b) Name principle components of a vapour compression refrigeration cycle. [3M]
- c) Classify refrigerants. [4M]
- d) What are the advantages and limitations of steam refrigeration system? [4M]
- e) Explain ASHRAE comfort chart. [4M]
- f) List out various Air conditioning equipments and mention their functions. [4M]

PART -B

- 2 a) What are the factors to be considered while the refrigeration system for an aero plane? Explain briefly. [6M]
- b) An air refrigerator working on the principle of Bell-Coleman cycle. The air into the compressor is at 1 atm at -10°C . It is compressed to 10 atm and cooled to 40°C at the same pressure. It is then expanded to 1 atm and discharged to take cooling load. The air circulation is 1 kg/s.
The isentropic efficiency of the compressor = 80%
The isentropic efficiency of the expander = 90%
Find the following:
i) Refrigeration capacity of the system
ii) C.O.P of the system
Take $\gamma = 1.4$, $C_p = 1.00 \text{ kJ/kg }^{\circ}\text{C}$ (solution) [10M]
- 3 a) State the effects of suction pressure and discharge pressure on performance of vapour compression system? [8M]
- b) A simple saturation cycle using F12 is designed for taking a load of 10 tons. The refrigerator and ambient temperatures are -1°C and 30°C respectively. A minimum temperature difference of 5°C is required in evaporator and condenser for heat transfer. Find:
i) mass flow rate through the system
ii) power required in kw.
iii) cylinder dimensions assuming $L/D = 1.2$ for single cylinder, single acting compressor if it runs at 300 r.p.m. with volumetric efficiency = 0.9. [8M]

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| 4 | a) | What are the desirable properties of refrigerants? Explain. | [8M] |
| | b) | Compare the performance of Reciprocating and Centrifugal compressors. | [8M] |
| 5 | a) | Explain how a double-effect Li Br-water absorption system differs from that of single-effect system. | [8M] |
| | b) | Explain the working of Vortex tube refrigerator. | [8M] |
| 6 | a) | Discuss the purpose of ventilation in air-conditioning system. | [8M] |
| | b) | Given for the air conditioning of a room
Room conditions: 26.5°C DBT and 50% RH
Room sensible heat gain = 26.3 kW
Room sensible heat factor = 0.82
Find (i) The room latent heat gain (ii) The apparatus dew point (iii) The cubic meter per minute of air if it is supplied to the room at the apparatus dew point (iv) The cubic meter per minute of specific humidity of air if it is supplied to the room at 17°C . | [8M] |
| 7 | a) | What are the different types of fans used in air-conditioning systems? Discuss their applications and relative advantages and disadvantages. | [8M] |
| | b) | Air from an air-conditioned room is exhausted into atmosphere through a grill. The quantity of air passes through the grill is 20 cubic meter minute. The duct area leading to the grill is 0.12 m^2 . The static pressure behind the grill is 3 mm of water. Find the effective area of grill exhausting the air into atmosphere. Take the pressure loss passing through the grill as 0.5 mm of water. | [8M] |
