H.T.No. | | | | | | | | | | |

Code No: ME1547 **GEC-R14**

IV B. Tech I Semester Supplementary Examinations, February 2018

REFRIGERATION AND AIR CONDITIONING

(Mechanical Engineering)

Time: 3 Hours **Max. Marks: 60**

Note: All Questions from **PART-A** are to be answered at one place.
Answer any **FOUR** questions from **PART-B.** All Questions Carry Equal Marks.

PART-A

6 × 2 = 12M

1. If the pressure ratio is 8, find the COP of Bell Coleman cycle.
2. Write any four desired properties of an ideal refrigerant.
3. What is the principle of steam jet refrigeration system?
4. Define dew point temperature.
5. What is the need for ventilation?
6. What are the factors affecting human comfort?

PART-B

4 × 12 = 48M

1. a) Describe, with a neat sketch, the operation of an air refrigeration system working on Bell-Coleman cycle. (6M)

   b) The capacity of the refrigerator is 200 TR when working between -6^{o}C and 25^{o}C. Determine mass of ice produced within 24 hours when water is supplied at 25^{o}C. Also find the minimum power required. Assume the cycle of operation is Carnot cycle and latent heat of ice 335 kJ/kg. (6M)

2. A refrigeration machine is required to produce ice at 0^{o}C from water at 20^{o}C. The machine has a condenser temperature of 298 K while the evaporator temperature is 268 K. The relative efficiency of the machine is 50% and 6 kg of Freon-12 refrigerant is circulated through the system per minute. The refrigerant enters and compressor with dryness fraction of 0.6. Specific heat of water is 4.187 kJ/kg K and the latent heat of ice is 335 kJ/kg. Calculate the amount of ice produced in 24 hours. The table of properties of Freon-12 is given below:

Temperature K	Liquid heat kJ/kg	Latent heat kJ/kg	Entropy of liquid kJ/kg
298	59.7	138.0	0.2232
268	31.4	154.0	0.1251

(12M)

3. Derive the expression for mass of motive steam required per kg of flash vapor produced in the flash chamber for a steam jet refrigeration system. (12M)

4. a) Define specific humidity, degree of saturation, relative humidity and wet-bulb temperature of moist air. (6M)

   b) 200 m^3 of air per min is passed through an adiabatic humidifier .The condition of air at inlet is 40^0C dry bulb temperature and 15 % relative humidity and the outlet condition is 25^0C dry bulb temperature and 20^0C wet bulb temperature. Find the dew point temperature at the outlet and the amount of water vapor added to the air per min. (6M)

5. An air conditioned auditorium is to be maintained at 27^0C DBT and 55% RH. The ambient condition is 39^0C DBT and 28^0C WBT. The total sensible heat load is 120000 kJ/h and the total heat load is 45000 kJ/h. 60 percent of the return air is recirculated and mixed with 40 percent make -up air after the cooling coil. The condition of the air leaving the coil is 17^0C. Determine
   i) Sensible heat factor
   ii) Condition of air entering the auditorium
   iii) Amount of makeup air
   iv) Apparatus dew point
   v) By -pass factor of the cooling coil (12M)

6. a) Explain the working of air washer humidifier with a neat sketch. (6M)

   b) Explain forced evaporation humidifier with a neat sketch. (6M)

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