

**337732(37)**

**B. E. (Seventh Semester) Examination,**

**April-May 2020/NOV-DEC 2020**

**(New Scheme)**

**(Mech. Engg. Branch)**

**REFRIGERATION & AIR-CONDITIONING**

**Time Allowed : Three hours**

**Maximum Marks : 80**

**Minimum Pass Marks : 28**

**Note :** All questions are compulsory. Part (a) is of (2) marks. Attempt any two from part (b) (c) (d) of 7 marks. Suitable weightage to be given for neat sketches.

**Unit-I**

1. (a) Draw Ph and TS diagram of simple vapour compression refrigeration cycle.

[ 2 ]

- (b) Draw the line diagram of simple vapour compression cycle and explain its working. 7
- (c) Explain with neat sketch of liquid vapour heat exchanger. 7
- (d) An ice plant produces 12 tons of ice per day at  $0^{\circ}\text{C}$  using water at  $30^{\circ}\text{C}$ . The plant operates on reverse Carnot cycle between  $-15^{\circ}\text{C}$  and  $28^{\circ}\text{C}$ . If the actual COP is 50% of the ideal COP and overall electro mechanical efficiency is 0.8, estimate the power rating of compressor motor. L.H. of ice = 335 kJ/kg.  $C_p$  of water =  $4.18 \text{ kJ/kgK}$ . 7

### Unit-II

2. (a) Enumerate the necessity of cooling of an aircraft. 2
- (b) Explain Brayton cycle with regenerative heat exchanger. 7
- (c) Explain construction and working of bootstrap aircraft refrigeration system. 7
- (d) A dense air refrigerator operates on Bell Coleman cycle and is required to produce 12 tons of

[ 3 ]

refrigeration. The cooler pressure is 4.5 bar and refrigerator pressure is 1.5 bar. The air is cooled in the air cooler to a temperature  $52^{\circ}\text{C}$  and temperature of air inlet to compressor is  $-10^{\circ}\text{C}$ . 7

Determine for ideal cycle.

- (i) COP
- (ii) Mass of air per minute
- (iii) Net power per ton of refrigeration

### Unit-III

3. (a) Name the equipments used in vapour absorption system. 2
- (b) Explain the construction and working of electronic refrigerator. 7
- (c) Give detailed classification of refrigerants. 7
- (d) Write notes on ammonia vapour refrigeration system. 7

### Unit-IV

4. (a) Define Bypass factor for a cooling coil. 2
- (b) Write short notes on :

[ 4 ]

- (i) Comfort chart
  - (ii) Air washer
  - (c) Explain with the help of psychrometric chart the following processes. 7
    - (i) Sensible cooling
    - (ii) Sensible heating
    - (iii) Adiabatic humidification
  - (d) Air at 25°C DBT and 15°C WBT at a pressure of 1.01325 bar is used to condition a space. Find by using psychrometric relations : 7
    - (i) Vapour pressure
    - (ii) Relative humidity
    - (iii) Specific humidity
    - (iv) Degree of saturation
- From steam table at 15°C  $P_v = 0.01704$  bar  
From steam table at 35°C  $P_v = 0.03166$  bar

#### Unit-V

5. (a) Define SHF. 2

[ 5 ]

- (b) Explain winter and summer air conditioning system. 7
- (c) Define following terms : 7
  - (i) RSHF
  - (ii) ERSHF
  - (iii) GSHF
- (d) Air at 12°C DBT and 70% RH is to be heated and humidified to 36.5°C DBT and 21°C WBT. The air is preheated sensibly before passing to the air washer in which water is circulated. The RH of the air coming out of air washer is 70%. This air is again reheated sensibly to obtain the final desired condition. 7

Find :

  - (i) Temperature to which the air should be preheated
  - (ii) Total heating required
  - (iii) Make up water in air washer
  - (iv) Humidifying efficiency of air washer