

16/05/2019

Roll No. ....

Total Pages : 03

BT-6/M-19

36040

REFRIGERATION AND AIR-CONDITIONING  
ME-302-E

Time : Three Hours]

[Maximum Marks : 100

Note : Attempt *Five* questions in all, selecting at least *one* question from each Unit.

Unit I

1. (a) Explain how refrigerant produces cooling effect.  
(b) List any *five* means of producing refrigeration.  
(c) "Refrigeration can be produced either by expansion of gas or throttling of gas." Discuss this statement.  
(d) When the use of Liquid gases and dry ice is preferred for refrigeration over other refrigeration systems ?  
(e) Explain the principle of evaporative refrigeration system. 20
  
2. Describe the working of Bell-Coleman Air refrigerator. What are various disadvantages of air refrigeration in comparison to other cold producing methods ? 20

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## Unit II

3. An ammonia refrigerating machine has working temperatures of  $35^{\circ}\text{C}$  in the condenser and  $-15^{\circ}\text{C}$  in the evaporator. Assume simple saturated cycle, find : 20
- (i) The theoretical piston displacement per ton of refrigeration
  - (ii) The theoretical horsepower per ton of refrigeration
  - (iii) The coefficient of performance
  - (iv) Heat rejected in the condenser

List out the advantages of vapour refrigeration system over air refrigeration system.

4. (a) Explain with neat sketch the working of  $\text{NH}_3$  absorption system. 8
- (b) In an absorption type Refrigerator, the heat is supplied to  $\text{NH}_3$  generator by condensing steam at 2 bar and 90 per cent dry. The temperature in the refrigerator is to be maintained at  $-5^{\circ}\text{C}$ . Find the maximum COP possible. If the refrigerator load is 18 tonnes and actual COP is 70 per cent of the maximum COP. Find the mass of steam required per hour. Take temperature of the atmosphere as  $30^{\circ}\text{C}$ . 12

### Unit III

5. Air at 32°C DBT and 20°C WBT is passed through a cooling coil maintained at 5°C. The heat extracted by the cooling coil from air is 14 kW and air flow rate is 42.5 m<sup>3</sup>/min. Determine : 20
- (i) DBT and WBT of the air leaving the coil; and
  - (ii) Coil by-pass factor.
6. Write short notes on the following : 20
- (a) Sensible heating
  - (b) Heating and Dehumidification
  - (c) By-pass factor
  - (d) Sling Psychrometer.

### Unit IV

7. An air conditioned auditorium is to be maintained at 27°C DBT and 55% RH. The ambient condition is 39°C DBT and 28°C WBT. The total sensible heat load is 120000 kJ/h and total latent heat load is 45000 kJ/h. 60 per cent of the return air is recirculated and mixed with 40 per cent of make-up air after the cooling coil. The condition of air leaving the coil is 17°C. Determine :
- (i) Room Sensible Heat Factor
  - (ii) Condition of air entering the auditorium
  - (iii) Amount of make-up Air
  - (iv) Apparatus dew point
  - (v) By pass factor of the cooling coil. 20
8. Enumerate and explain the components of cooling load estimate. What points should be considered while calculating heating load estimate ? 20