

Total No. of Questions : 10]

SEAT No. :

P1973

[Total No. of Pages : 4

[5059] - 561

**B.E. (Automobile Engineering)**

**AUTOMOTIVE REFRIGERATION & AIR CONDITIONING**

**(2012 Pattern) (Semester - I)**

*Time : 2½ Hours]*

*[Max. Marks :70*

*Instructions to the candidates:*

- 1) *Answer five questions.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Assume suitable data, if necessary.*

**Q1)** a) With the help of T-S diagram, distinguish between wet compression and dry compression. What are disadvantages of wet compression?[4]  
b) An ice plant produces 30 tons of ice at 0°C per day from water at 0°C. The condensation and evaporation takes place at 20°C and -20°C respectively. There is no under cooling of liquid and vapour drawn by compressor are dry and saturated.  $C_p$  of vapour = 1.1 kJ/Kg K. [6]  
Estimate:

1. Rate of circulation of refrigerant in kg/min
2. Theoretical C.O.P
3. Compressor work if actual C.O.P is 80% of theoretical.

Properties of refrigerants are :

Sat. Temp. °C	$h_f$ (kJ/Kg)	$h_g$ (kJ/Kg)	$s_f$ (kJ/kg K)
20	275	1462	1.043
-20	89.6	1419	0.368

Take heat of fusion of ice as 335 kJ/kg.

OR

- Q2)** a) Write a short note on Temperature control systems. [5]  
b) Explain the ideal properties of refrigerants. [5]

*P.T.O.*

- Q3) a)** Write a short note on Future refrigerants. [5]  
b) With neat sketch explain Reverse Carnot cycle. [5]

OR

- Q4)** Explain in detailed with neat sketch: [10]  
a) flow control devices  
b) receiver driers & desiccants

- Q5) a)** Write a short note on : [8]  
i) By Pass Factor  
ii) Sensible heat factor  
b) Air at 10°C dry bulb temperature and 90% relative humidity is to be heated and humidified to 35°C dry bulb temperature and 22.5°C wet bulb temperature. The air is preheated sensibly before passing to the air washer in which water is re-circulated. The relative humidity of air coming out of the air washer is 90%. This air is again reheated sensibly to obtain the final desired condition. Find: [8]  
i) The temperature to which the air should be preheated  
ii) The total heating required  
iii) The make up water required in the air washer  
iv) The humidifying efficiency of the air washer

OR

- Q6) a)** With neat sketch explain [8]  
i) Combination of process used in winter air conditioning  
ii) Adiabatic mixing of two air streams  
b) 300m<sup>3</sup> of air is supplied per minute from out-door conditions of 40°C dry bulb temperature and 26°C wet bulb temperature to an air conditioned room. The air is dehumidified first by a cooling coil having BPF 0.32 and dew point temperature 15°C and then by a chemical dehumidifier. Air leaves the chemical dehumidifier at 30°C dry bulb temperature. Air is then passed over a cooling coil whose surface temperature is 15°C and BPF 0.26. Calculate the capacities of the two cooling coils and dehumidifier. [8]

- Q7) a)** Write a short note on **[8]**
- i) Air conditioning electrical & electronic control.
  - ii) Outside & inside design consideration for Load Analysis in psychometric.
- b) An air conditioned cabin is to be maintained at 27°C dry bulb temperature and 60% relative humidity. The ambient condition is 40°C dry bulb temperature and 30°C wet bulb temperature. The total sensible heat load is 100000kJ/h and the total latent heat load is 40000 kJ/h. 60% of the return air is recirculated and mixed with 40% of make up air after the cooling coil. The condition of air leaving the cooling coil is at 80°C: Determine: **[10]**
- i) Room sensible heat factor
  - ii) The condition of air entering the cabin
  - iii) The amount of make up air
  - iv) Apparatus dew point
  - v) BPF on cooling coil
- Show the process on psychometry chart.

OR

- Q8) a)** The following data supply to an air conditioning system. **[10]**
- Room sensible heat = 5.8kW  
 Room latent heat = 5.8kW  
 Inside design consideration = 25°C DBT and 50% RH  
 Outside design consideration = 35°C DBT and 28°C WBT
- An inside air within the vehicle is mixed with outside air before entering the cooling coil in the ratio 4:1. The coil BPF is 0.1 and ADP is 10°C. The vehicle inside air is again mixed with the air leaving the cooling coil in the ratio 1:4 and the mixture is then allowed to enter the reheat coil before being supplied into the vehicle. Determine:
- i) Supply air condition to the vehicle cabin
  - ii) Reheater capacity
  - iii) Refrigeration capacity of cooling coil
  - iv) Quantity of fresh air supplied
- b) Define: **[8]**
- i) Room sensible heat factor
  - ii) Effective room sensible factor
- If a room has a sensible heat gain of 24kW and a latent heat gain of 5.2kW and it has to be maintained at 26°C DBT and 50% RH. 180m<sup>3</sup>/min of air is delivered to the room. Determine the state of supply air.

- Q9)** a) Write a short note on: [10]  
i) sight glass  
ii) refrigerant handling  
b) What is system flushing? Explain flushing method. [6]

OR

- Q10)**a) What is system oil? Explain following system oils: [10]  
i) lubricant  
ii) mineral and PAG  
iii) polyol ester oil  
b) Explain pressure gauge reading and its cycle testing. [6]

