

Total No. of Questions : 10]

SEAT No. :

P3538

[Total No. of Pages : 4

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B.E. Automotive Refrigeration and Air Conditioning

AUTOMOBILE

(2012 Pattern) (Semester-I)

Time : 2.30 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Neat diagrams must be drawn whenever necessary.*
- 2) *Use of logarithmic tables slide rule, Mollier charts, Psychometric chart electronic pocket calculator and steam tables is allowed.*
- 3) *Assume Suitable data, if necessary.*
- 4) *All questions are compulsory*

- Q1)** a) Write a short note on 'Refrigerating effect' and derive its units. [4]
- b) A dense air refrigerating system operating between pressure of 17.5 bar and 3.5 bar to produce 10 TR. Air leaves the refrigerating coil at -7°C and it leaves the air cooler at 15.5°C . Neglecting losses and clearance. Calculate net work done per minute and coefficient of performance. For Air $C_p=1.005\text{kJ/kg K}$ and $\gamma = 1.4$. [6]

OR

- Q2)** a) Write a short note on refrigerant piping by considering following points: [4]
- i) Location and arrangement of piping
 - ii) Vibration and noise in piping
 - iii) Flow rate
 - iv) Pressure drop in refrigerant piping
- b) A capacity of refrigerator is 200 TR when working between -6°C and 25°C . Determine the mass of ice produced per day from water at 25°C . Also find the power required to drive unit. Assume that cycle operates on reversed Carnot cycle and latent heat of ice is 335kJ/Kg . [6]

P.T.O.

Q3) Explain in brief which refrigerant/s would you choose for each of the following applications and why? [10]

- i) Air conditioning plants, automobile air conditioning
- ii) Air conditioning of hospitals, theatres, hotels and marine service
- iii) Industrial applications where reciprocating compressor is used
- iv) Industrial ice plants, cold storage, skating rinks

OR

Q4) Write a short note on [10]

- i) Vehicle operation modes & Cool-down Performance.
- ii) Air management and heater system

Q5) a) What is fog? Show on chart how two air streams on mixing would produce fog? Why does fog occur in winter night and not in summer night? [8]

b) Air at 10°C DBT & 90% RH is to be heated & humidified to 35°C DBT & 22.5°C WBT. The air is preheated sensibly before passing to the air washer in which water is recirculated. The RH 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 temp. to which air should 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) What is the process used for low relative humidity requirement in room? Describe it with neat sketch. [8]

b) On a particular day, the atmospheric air was found to have a DBT of 30°C and WBT 18°C. The barometric pressure was observed to be 756 mm of Hg. Obtain following properties without using psychrometric chart. [8]

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- i) RH
 - ii) Specific humidity
 - iii) Dew point temperature
 - iv) Enthalpy of air per Kg of dry air
 - v) Volume of moisture per kg of dry air
- (Use steam table)

Q7) a) Define following with neat sketch: [9]

- i) OASH
- ii) ERSHF
- iii) GS HF

b) The following are design data for an air conditioning system proposed for vehicle: [9]

Outside design conditions= 34°C DBT, 28°C WBT

Inside design condition= 24°C DBT, 50% RH

Solar heat gain through vehicle body= 4.7 kW

Solar heat gain through glass area= 4.7 kW

Occupants= 0.5

Sensible heat gain per person= 85W

Latent heat gain per person= 105W

Internal lighting load= 4 fluorescent fixture of 20 W each

sensible heat gain from other sources= 11.6kW

infiltration air= $14\text{m}^3/\text{min}$

By pass factor of the cooling coil used= 0.15

If return and outdoor air are adiabatically mixed in ratio of 3:2 (by mass) and then passed through the conditioner, Determine

- i) DBT and WBT of supply air
- ii) ADP
- iii) capacity of air conditioning plant

OR

Q8) The following data supply to an air conditioning system. **[18]**

Room sensible Heat=5.8kw

Room latent Heat=5.8kW

Outside design conditions=35°C DBT, 28°C WBT

Inside design condition=25°C DBT,50% RH

An air within the vehicle is mixed with outside air before entering the cooling coil in the ratio 4:1. The coil by pass factor is 0.1 and ADP is 10°C. The vehicle inside air is again mixed with the air leaving cooling coil in the ratio 1:4 and the mixture is then allowed to enter the reheater 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) Quality of fresh air supplied

Q9) a) Explain Any 2 from the following **[8]**

- i) Initial vehicle inspection
- ii) Temperature measurement
- iii) Odour removal
- iv) Retrofitting

b) Write a short note on refrigerant recovery, recycle and charging. **[8]**

OR

Q10)a) Explain pressure gauge readings and its cycle testing. **[8]**

- b) Write a short note on **[8]**
- i) Sight glass
 - ii) Refrigerant handling

