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Paper Code : AUE-802B

AUTOMOTIVE AIR CONDITIONING

Time Allotted : 3 Hours | *Full Marks* : 70

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

GROUP – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for the following : $10 \times 1 = 10$

i) The vapour compression refrigerator employs which of the following cycles ?

a) Rankine b) Carnot

c) Reversed Rankine d) Braton

e) Reversed Carnot.

ii) The refrigerant should have

a) high sensible heat b) high total heat

c) high latent heat d) low latent heat

e) low sensible heat.

iii) If T_1 and T_2 be the highest and lowest absolute temperatures encountered in a refrigeration cycle working on a reversed Carnot cycle, then COP is equal to

a) $\frac{T_1}{T_1 - T_2}$ b) $T_2(T_1 - T_2)$

c) $\frac{T_1 - T_2}{T_2}$ d) none of these.

iv) The leaks in a refrigeration system using Feron are detected by

a) Halide Torch which on detection gives flame lighting

b) Sulphur sticks which on detection gives white smoke

c) Using reagents

d) Smelling.

v) Relative humidity is equal to

a) $\frac{pv}{ps}$ b) $\frac{ps}{ph}$

c) $1 - \frac{pv}{ps}$ d) $1 - \frac{ps}{pv}$

e) $ps - pv$

vi) Dew point is

a) the temperature at which condensation of steam in saturated air will start

b) the lowest attainable temperature for a mixture of air and steam

c) dependent on pressure of air

d) used in connection with air conditioning

e) none of these.

vii) On psychometric chart, relative humidity lines are

a) horizontal

b) vertical

c) straight inclined sloping downward towards the right

d) curved

e) none of these.

viii) If S is the sensible heat and L the latent heat, then sensible heat factor is given by

a) $\frac{S}{S+L}$ b) $\frac{L}{S+L}$

c) $\frac{S+L}{S}$ d) $\frac{S+L}{L}$

e) $\frac{S}{S-L}$.

ix) Vehicle speed will ..... when air condition system is on.

a) decreases b) same

c) increases d) none of these

x) Enthalpy of air-vapour mixture consists of

a) sensible heat of dry air between 0°C and dry bulb temperature

b) total enthalpy of the contained water

c) vapour at saturation temperature

d) heat of superheat of the contained water vapour

e) all of these.

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. 3 × 5 = 15

2. What is the function of expansion valve ? How does it operate ?
3. Explain the properties of good refrigerant used in a car for air conditioning.
4. What do you mean by refrigerant effect and COP in an air conditioning system ?
5. What are the properties of good refrigerant oil used in automobile ?
6. When is dehumidification of air necessary and how is it achieved ?

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. 3 × 15 = 45

7. a) What do you mean by air conditioning of passenger car ? Explain with a diagram the automobile air conditioning system used on passenger car.

b) Sketch the *T-s* and *p-H* diagram for the vapour compression cycles when the vapour after compression is (i) dry saturated and (ii) wet. 9 + 6

8. A car of 32 person capacity is provided air conditioning of a system with following data :

Outdoor conditions 35°C DBT and 29°C WBT, required comfort conditions 24°C DBT and 60% R.H., outdoor air supplied 0·4 m^3/min/person, sensible heat load 125000 kJ/hr, latent heat load 42000 kJ/hr. Find the sensible heat factor of the system.

9. a) What are the common problems and their remedies in automobile air conditioning system ?

b) What are the preliminary checks that must be made when checking the refrigerant system ?

10. a) Explain the most common causes of insufficient cooling in air-conditioning system.

b) Describe the harmful effect of moisture in air conditioning system. 10 + 5

11. A single psychrometer reads 42°C DBT and 30°C WBT.

Calculate the following :

a) Specific humidity

b) Relative humidity

c) Partial pressure of water vapour

d) Dew point temperature

e) Enthalpy of mixture per kg of dry air.