

CS/B.Tech/Even/AUE/8th Sem/AUE-802B/2014

2014

Automotive Air Conditioning

Time Alloted : 3 Hours

Full Marks : 70

*The figure 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 any ten of the following:

10x1=10

- i) Dehumidification is the process of removing moisture from air with dry bulb temperature
- a) increasing
 - b) decreasing
 - c) corresponding to saturation condition.
 - d) None of the above.
- ii) The comfort conditions in air conditioning system are defined by
- a) 22°C dry bulb temperature (DBT) and 60% relative humidity (RH)

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- b) 25°C DBT and 100% RH
 - c) 20°C DBT and 75% RH
 - d) 15°C DBT and 80% RH
- iii) Sensible heating is needed to
- a) vaporize water into steam and vice versa
 - b) change temperature of liquid or vapour
 - c) convert water into steam and superheat it.
 - d) measure dew point temperature
- iv) The comfort conditions in air conditioning system are defined by
- a) 25°C dry bulb temperature (DBT) and 60% relative humidity (RH)
 - b) 20°C DBT and 75% RH
 - c) 15°C DBT and 80% RH
 - d) None of the above.
- v) Air is dehumidified by
- a) heating
 - b) cooling
 - c) chemical absorption
 - d) a and c
- vi) The vapour compression refrigerator employs the following cycle.
- a) Rankine
 - b) Carnot
 - c) Braton
 - d) None of the above. .

vii) The refrigerant should have.

- a) high total heat
- b) Low latent heat
- c) low sensible heat.
- d) none of the above.

viii) The value of COP in vapour compression cycle is usually

- a) always less than unity
- b) equal to unity.
- c) any one of the above
- d) none of the above.

ix) In vapour compression refrigeration system, refrigerant occurs as liquid between.

- a) condenser and expansion valve
- b) compressor and evaporator
- c) compressor and condenser
- d) none of the above.

x) The coefficient of performance is the ratio of refrigerant effect to the .

- a) work done by compressor
- b) enthalpy increase in compressor
- c) all of the above
- d) none of the above.

xi) In sensible heating/cooling , following parameter remains constant

- a) dry wet bulb temperature
- b) wet bulb temperature
- c) relative humidity
- d) enthalpy

GROUP - B

(Short Answer Type Questions)

Answer any *three* of the following. 3x5=15

2. 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 saturated

3. Define the following:

- i) specific humidity
- ii) Absolute humidity;
- iii) Relative humidity;
- iv) Dew point temperature.

4. Establish the following expression for air vapour mixture.

$$W = 0.622 (P_v / (P_b - P_v))$$

5. What is the purpose of a thermostat in the air conditioning system? Explain with a neat sketch the function of the thermostat. Indicate where it is placed in automobile.
6. What are the factors responsible for automobile compartment heating and heat absorption?

GROUP - C

(Long Answer Type Questions)

Answer any *three* of the following. 3x15=45

7. a) Describe with schematic diagram, the working principal of the refrigeration cycle used in an Automobile.
b) Draw and explain the T-S and P-h diagram of simple vapour compression refrigeration system for dry saturated vapour after compression.
- (9+6)
8. A vapour compression refrigeration works between the pressure limits of 60 kgf/cm² and 25 kgf/cm² the working fluids is just dry at the end of compression and there is no under cooling of the liquid before the expansion valve. Determine: (a) C.O.P. of the cycle, and (b) capacity of the refrigerator if the fluid flow is at the rate of 5 kg/min.

Pressure Kgf/cm ²	Saturation temp. K	Enthalpy Kcal/kg		Entropy Kcal/kg/K	
		Liquid	Vapour	Liquid	Vapour
60	295	14.8	49.7	0.047	0.167
25	261	-4.4	56	-0.018	0.214

(15)

9. a) Discuss the common problems and their remedies in automobile air-conditioning system. :
b) What are the causes of excessive heat in a car air conditioning system?
c) Discuss suitable method for decreasing heat load through window of Automobile.

(5+5+5)

10. Write Short Notes (any three)

- (a) Human comfort factors.
- (b) Thermostatic valves.
- (c) Compressor in the automobile air conditioning system.
- (d) Duct system of automobile air conditioning systems.

(5+5+5)

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- 11. A car of 25 person capacity is provided air conditioning of a system with following data:**

Outdoor conditions 34°C DBT and 28°C WBT, required comfort conditions 24°C DBT and 50% R.H. outdoor air supplied 4m³/min/person, sensible heat load 125600 kJ/hr Latent heat load 42000 kJ/hr. Find the sensible heat factor of the system. What would be the change of heat load if no. of person in the car becomes 15?
(15)