Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/B.Tech (AUE)/SEM-8/AUE-818/2011

2011

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 × 1 = 10

i) In vapour compression cycle, the condition of refrigerant is high pressure saturated liquid

a) after passing through the condenser

b) before passing through the condenser

c) after passing through the expansion or throttle valve

d) before entering the expansion valve

e) before entering the compressor.

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

a) always less than unity

b) always more than unity

c) equal to unity

d) any one of the above

e) none of these.

iii) Relative humidity is equal to

a) pv/ps

b) ps/ph

c) 1 – pv/ps

d) 1 – ps/pv

e) ps – pv,

pv = partial pressure of water vapour in air

ps = saturation pressure of water vapour at same temperature.

iv) Wet bulb temperature is

a) indication of amount of moisture in air

b) measured by wetting the bulb of the thermometer

c) less than dry bulb temperature

d) dependent on the dryness and temperature of air

e) none of these.

v) Dew point temperature is constant as long as there is

a) no change in moisture content of the air

b) no change in the volume of air

c) no change in wet bulb and dry bulb temperatures

d) no change in relative and specific humidity of air

e) continuous increase in moisture content of air.

vi) Psychrometric chart

a) is seldom used for air conditioning design

b) provides plots for moist air conditions

c) enables to determine wet bulb and dew point temperature

d) is a chart for conversion of British system into metric system

e) is used to determine properties of refrigerants.

vii) The refrigerant should have

a) high sensible heat

b) high total heat

c) high latent heat

d) low latent heat

e) low sensible heat.

viii) The leaks in a refrigeration system using feron are detected by

a) halide torch which on detection flame lighting

b) sulphur sticks which on detection gives white smoke

c) using reagents

d) smelling

e) sensing reduction in pressure.

ix) 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) $S+\frac{S}{L}$

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

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

x) In humidification process

a) relative humidity increases

b) relative humidity decreases

c) specific humidity increases

d) specific humidity decreases

e) specific humidity and relative humidity remains same.

GROUP – B
(Short Answer Type Questions)

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

2. Discuss the human comfort factor in air conditioning system.

3. Describe the refrigeration cycle with diagram used in Automobile.

4. What are the different types of leak detection methods used in refrigerant system ?

5. When is dehumidification of air necessary and how is it achieved ?

6. Why is moisture harmful to the air conditioning system ?

GROUP – C

(Long Answer Type Questions)

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

7. A refrigeration system using R-12 as refrigerant operates between the pressure 2·5 kgf/cm^2 and 9 kgf/cm^2. The compression ratio is isentropic and there is no undercooling in the condenser. The vapour is in dry saturated condition at the beginning of the compression. Estimate the theoretical C.O.P. If the actual C.O.P. is 0·65 of theoretical value, calculate the net cooling produced per hour. The refrigerant flow is 5 kg per minute. Take C_p for superheated vapour at 9 kgf/cm^2 as 0·16 kcal/kg °C. Properties of refrigerant are –

Pressure kgf/cm^2	Saturation temp. °C	Enthalpy kcal/kg		Entropy of saturated vapour kcal/kg/°C
		Liquid	Vapour	
9	36	109	139·8	1·132
2·5	– 7	98·5	136·2	1·137

8. a) For the sample of air having 22° C DBT, relative humidity 30% at barometric pressure of 760 mm Hg. Calculate :

   i) Vapour pressure

   ii) Humidity ratio

   iii) Vapoure density

   iv) Enthalpy.

   b) Find the above value by psychrometric chart and compare with calculating value. 9 + 6

9. 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 0·4 m^3/min/person, sensible heat load 125600 kJ/hr, Latent heat load 42000 kJ/hr. Find the sensible heat factor of the system.

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

b) What are the factors responsible for automobile compartment heating and heat absorption ? 9 + 6

11. a) Explain the function of the three-section of the duct system.

b) What are the preliminary checks that must be made when checking the refrigerant system ? 10 + 5