

CS/B.Tech/AUE/Even/Sem-8th/AUE-802B/2015



WEST BENGAL UNIVERSITY OF TECHNOLOGY

AUE-802B

AUTOMOTIVE AIR CONDITIONING

Time Allotted: 3 Hours

Full Marks: 70

*The questions are of equal value.*

*The figures in the margin indicate full marks.*

*Candidates are required to give their answers in their own words as far as practicable. All symbols are of usual significance.*

**GROUP A**  
**(Multiple Choice Type Questions)**

1. Answer all questions. 10×1 = 10
- (i) In vapour compression cycle, the condition of the refrigerant is very wet vapour  
(A) after passing through the condenser  
(B) before passing through the condenser  
(C) after passing through expansion or throttle valve  
(D) before entering the expansion valve
- (ii) If S is the sensible heat and L the latent heat, then sensible heat factor is given by  
(A)  $S/S+L$  (B)  $L/S+L$  (C)  $S+L/S$  (D)  $S+L/L$  (E)  $S/S-L$
- (iii) 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

CS/B.Tech/AUE/Even/Sem-8th/AUE-802B/2015

- (iv) The coefficient of performance is the ratio of refrigerant effect to the  
(A) heat of compression  
(B) work done by compressor  
(C) enthalpy increase in compressor  
(D) all of these
- (v) Relative humidity is  
(A) something concerned with air conditioning  
(B) the ratio of moisture present in air to the capability of air to hold the maximum moisture  
(C) the ratio of actual humidity to absolute humidity  
(D) representative of amount of moisture held in air
- (vi) Vapour compression refrigerator employs the following cycle  
(A) Braton (B) Rankine  
(C) Carnot (D) None of these
- (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) In sensible heating/cooling, which of the following parameter remains constant  
(A) dry wet bulb temperature (B) wet bulb temperature  
(C) enthalpy (D) relative humidity
- (ix) 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)  $T_1/(T_1-T_2)$  (B)  $T_2/(T_1-T_2)$  (C)  $(T_1-T_2)/T_2$  (D)  $(T_1-T_2)/T_1$
- (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

CS/B.Tech/AUE/Even/Sem-8th/AUE-802B/2015

**GROUP B**  
(Short Answer Type Questions)

Answer any *three* questions.

3 × 5 = 15

2. What do you mean by refrigerant effect & COP in an air conditioning system?
3. What are the properties of good refrigerant oil used in a automobile?
4. What is one of the most common causes of insufficient cooling?
5. When is dehumidification of air necessary and how it is achieved?
6. Why is moisture harmful to the air conditioning system?

**GROUP C**  
(Long Answer Type Questions)

Answer any *three* questions.

3 × 15 = 45

7. A refrigeration system using R-12 as refrigerant operates between the pressure 3 kgf/cm<sup>2</sup> and 9 kgf/cm<sup>2</sup>. The compression ratio is isentropic and there is no under cooling 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 5kg per minute. Take Cp for superheated vapour at 9kgf/cm<sup>2</sup> as 0.16 kcal/kg °C. Properties of refrigerant are:

Pressure Kgf/cm <sup>2</sup>	Saturation temp. °C	Enthalpy Kcal/kg		Entropy of saturated vapour Kcal/kg/ °C
		Liquid	Vapour	
9	40	111	140	1.1301
3	-11	98	136	1.142

CS/B.Tech/AUE/Even/Sem-8th/AUE-802B/2015

8. A single psychrometer reads 42°C D.B.T. and 30°C W.B.T. 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.
9. The atmospheric air at 30°C dry bulb temperature and 75% relative humidity enters a cooling coil at the rate of 200 m<sup>3</sup>/min. The coil dew point temperature is 14°C and the by pass factor of the coil is 0.1. Determine (a) the temperature of air leaving the cooling coil, (b) the capacity of the cooling coil in tons of refrigeration and in kilowatt, (c) the amount of water vapour removed per minute, and (d) the sensible factor for the process. 4+4
- 10.(a) What do you mean by air-conditioning of passenger car? Explain with a diagram the automobile A/C system used in passenger car.  
(b) What are the factors responsible for automobile compartment heating and heat absorption?
- 11.(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?