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B.E. AUTOMOBILE Semester-VII Nov/Dec-2016

Subject: Refrigeration and Air-conditioning
Subject Code: AE703

Date: 10/11/2016
Time: 10:30 am to 01:30 pm
Total Marks: 70

Instructions:

1. Answer each section in separate Answer sheet.
2. Use of Scientific calculator is permitted.
3. All questions are **Compulsory**.
4. Indicate **clearly**, the options you attempt along with its respective question number.
5. Use the last page of main supplementary of **rough work**.

SECTION-I

Que:1 (A) Explain the following terms briefly : (any 5)

- 1) Wet bulb temperature
- 2) Dew point temperature
- 3) Psychrometry
- 4) Comfort Air conditioning
- 5) Relative humidity
- 6) Cooling and Dehumidification

[5]

(B) With a diagram explain Li-BR Vapor absorption refrigeration system and write its application.

[5]

(C) Explain standard vapour compression refrigeration cycle with T-S and P-H diagram.

[5]

OR

(C) A Derive equation of COP for Bell-Coleman Air-refrigerator show different processes on P-V and T-S Diagram

[5]

Que:2 (A) Classify Fan used in air-conditioning system. Explain selection of the Fan using fan characteristic curve.

[5]

(B) Explain construction, working, advantages and disadvantages of Thermostatic Expansion valve with neat sketch.

[5]

OR

(A) State the name of Different types of evaporative devices used in refrigeration system Explain Thermostatic expansion valve.

[5]

(B) Draw a neat sketch of Automatic Expansion valve and write its advantage and disadvantages.

[5]

Que:3 (A) Give the full name of the following refrigerants:

- | | | |
|----------|------------|-----------|
| 1) R-12, | 2) R-22, | 3) R-600, |
| 4) R717, | 5) R-134a, | 6) R-150 |

[5]

(B) A simple NH_3 vapour compression system has compressor with piston displacement of $2 \text{ m}^3/\text{minute}$, a condenser pressure of 12 bar and evaporator pressure of 2.5bar. the liquid is sub-cooled at 20°C by soldering liquid line to compressor cooling water is 5000 kJ/hour, and volumetric efficiency of compressor is 0.8.

[5]

Compute: Capacity; Indicated Power and C.O.P. of system.

*assume appropriate data.

OR

(A) Compare between water cooled and air cooled condensers. Explain evaporative condenser.

[5]

(B) The following data refers to a 20 TR ice plant using ammonia as refrigerant: The temperature of water entering and leaving the condenser are 20°C and

[5]

27°C and temperature of brine in the evaporator is -15°C. Before entering the expansion valve, ammonia is cooled at 20°C and the ammonia enters the compressor dry saturated. Calculate for one ton of refrigeration the power expended, the amount of cooling water in the co-efficient of performance of the plant.

Use the properties given in the table below:

Saturation temperature °C	Enthalpy, KJ/Kg		Entropy, KJ/Kg K		Specific heat, KJ/Kg K	
	Liquid	Vapour	Liquid	Vapour	Liquid	Vapour
-15	112.34	1426.54	0.4572	5.5490	4.396	2.303
25	298.90	1465.84	1.1242	5.0391	4.606	2.805
*assume appropriate data if found necessary.						

SECTION-II

- Que:4 (A)** Write a brief note on Human comfort and briefly explain factors governing effective temperature [5]
- (B)** Which factors are to be considered in 'Load Estimation Sheet' for comfort application? [5]
- (C)** Explain equal friction method of duct sizing for air conditioning Under what situation is this method recommended .What are its disadvantages? [5]

OR

- (C)** Explain Velocity reduction method of duct design. State its advantages and disadvantages. [5]
- Que:5 (A)** Classify air conditioning systems. Explain Central air conditioning system with a neat sketch. [5]
- (B)** In a heating application, moist air enters a steam heating coil at 10°C, 50% RH and leaves at 30°C. Determine the sensible heat transfer, If mass flow rate of air is 100kg of dry air per second. Also determine the steam mass flow rate if steam enters saturated at 100°C and condensate leaves at 80°C. [5]

OR

- (A)** Write short note on refrigeration aspect ice manufacturing unit. [5]
- (B)** Write short note on tunnel ventilation. [5]

- Que:6 (A)** Explain the procedure for calculating cooling load due to infiltration air. [5]

- (B)** A conference room for seating 100 persons is to be maintained at 22°C dry bulb temperature and 60 % relative humidity. The outdoor conditions are 40°C dry bulb temperature and 27 °C wet bulb temperature. The various loads in the auditorium are as follows:
Sensible and latent heat load per person ,80 W and 50 W respectively ; light and fans 15000W ; sensible heat gain through glass , walls , ceiling etc...,15000 W. the air infiltration is 20 m³ / min and fresh air supply is 100 m³/min. Two -third of recirculated room air and one third of fresh air are mixed before entering the cooling coils. The by pass factor of the coil is 0.1. Determine apparatus dew point the grand total heat load and effective room sensible heat factor. Assume appropriate data. [5]

OR

- (A)** Explain with neat sketch 'Year round air-conditioner' [5]
- (B)** Enlist parameters affecting cooling load calculations. And describe any 3 in detail. [5]

Best of luck