SL-323

Total No. of Pages :3

Seat No.	

B.E. (Mechanical) (Part-IV) (Semester-VII) (New) (Revised) Examination, May - 2017

REFRIGERATION AND AIR CONDITIONING

Sub. Code : 67501

Day and Date : Monday, 15-05-2017 **Total Marks : 100**

Time : 2.00 p.m. to 5.00 p.m.

Instructions :
1) **Attempt all question.**
2) **Figures to the right indicate full marks.**
3) **Use same answer book.**
4) **Neat diagrams must be drawn.**
5) **Use of steam table, refrigerant/Psychrometric charts, tables are allowed.**
6) **Make suitable assumptions if required.**

Q1) Attempt any two.

a) The c.o.p of air refrigerations cycle is low, but still air refrigeration system is most common in Air crafts discuss the statement. **[8]**

b) Justify the following statements briefly.

i) COP of carnot refrigerator will be higher in winter than summer. **[4]**

ii) Carnot COP of domestic refrigerator is less than carnot COP of domestic air conditioner. **[4]**

c) A reversed carnot cycle has a COP of 5.5. Determine the absolute temperature ratio high temperature to low temperature.

If power consumption of the cycle is 8kW. What is the refrigerating capacity of the machine in TR?

If the cycle is used as a heat pump with same ratio of high to low temperatures. Determine its C.O.P for heating and quantity of heat pumped. **[8]**

Q2) Attempt any two.

a) Discuss the following cases, **[8]**

i) Wet Versus Dry compression.

ii) Throttling Versus Isentropic Expansion.

P.T.O.

b) What do you mean by multistaging and why it is necessary? Explain with line diagram multistage compression with flash gas intercooler to operate a low temperature evaporator and represent on p.h diagram. [8]

c) A simply vapour compression refrigeration system uses methyl chloride (R - 40) and operates between temperatures of –10°C and 45°C. At entry to the compressor, the refrigerant is dry saturated and after adiabatic compression it attains 60°C. Find C.O.P of the refrigeration system.

The properties of methyl chloride are as follows. [8]

Saturation temperature in °C	Enthalpy in kJ/kg		Entropy in kJ/kg-k	
	Liquid	Vapour	Liquid	Vapour
–10	45.4	460.7	0.183	1.637
45	133.0	483.6	0.485	1.587

Q3) Attempt any two.

a) Suggest with proper reasons type of refrigerant used for following applications. [9]

i) Domestic refrigerator. ii) Cold storage of 100 JR.

iii) Ice Cream plant. iv) Room air conditioner.

b) Write note on. [9]

i) Azeotropes, ii) Secondary refrigerants.

c) Discuss in detail refrigerator controls and draw neat sketch of thermostat. [9]

Q4) Solve any two.

a) Define Relative humidity and Degree of saturation. [8]

Derive the expression;

$$\phi = \frac{\mu}{1-(1-\mu)\frac{P_s}{P}}$$

Where P_s: Partial pressure of water vapour at saturation condition.

P: Total pressure.

ϕ: Relative humidity.

μ: Degree of saturation.

b) With help of psychrometric chart explain the process of sensible and latent heat transfer between air and wetted surface at temperature t and t_s. The specific humidity and enthalpy values w, w_s, h, h_s. [8]

c) Moist air has DBT = 25°C, degree of saturation 30% total pressure 1.01325 bar. Use psychrometric equations and steam table to calculate enthalpy and volume per kg of air. [8]

Q5) Solve any two.

a) Briefly explain ADP, Thermodynamic WBT, cooling coil capacity and By pass factor. List factors affecting By pass factor. [9]

b) With help of comfort chart explain factors conductive to comfort. Write note on body regulatory process against heat and cold. [9]

c) Sensible heat gain and latent heat gain are 65 kw and 8 kw. respectively. The desired room condition is DBT 24°C and RH 50% . The out door air at DBT 35°C and WBT 25°C is mixed with recirculated air in the ratio 1:4. The mixture enters cooling coil and leaves the coil at DBT 12.5°C. The bypassed air gets mixed with air leaving the coil and is supplied to room at 14°C DBT. Find S.H.F, enthalpy of air entering room and cooling capacity of the coil. [9]

Q6) Solve any two.

a) Write a brief note with equations if any for the sources of heat load for large air conditioning installation. [8]

b) Write a note on friction loss chart, Equivalent length, methods of duct sizing, and conversion from circular to rectangular shape in duct sizing. [8]

c) With neat sketch discuss the various duct layouts. Also write the requirements of air distribution. [8]

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