

22660

22232

3 Hours / 70 Marks

Seat No.

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- Instructions :**
- (1) All Questions are *compulsory*.
 - (2) Answer each next main Question on a new page.
 - (3) Illustrate your answers with neat sketches wherever necessary.
 - (4) Figures to the right indicate full marks.
 - (5) Assume suitable data, if necessary.
 - (6) Use of Non-programmable Electronic Pocket Calculator is permissible.
 - (7) Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.
 - (8) Use of Psychrometric chart is permissible.

Marks

1. Attempt any FIVE of the following :

10

- (a) Define unit of refrigeration. State its value in S.I. system.
- (b) List the factors which decides the comfort condition.
- (c) State the function of
 - (i) Absorber
 - (ii) Rectifier used in vapour absorption refrigeration system.
- (d) Classify the condensers used in refrigeration.
- (e) State the necessity of air-conditioning.
- (f) Define the terms :
 - (i) DBT
 - (ii) DPT
- (g) List the elements of air distribution system.



2. Attempt any THREE of the following :**12**

- (a) Represent the Bell Coleman cycle and Reversed Carnot cycle on T-S chart. Point out the two similarities and two dissimilarities between them.
- (b) Represent the Vapour Compression Refrigeration cycle with subcooling on P-h & T-S chart. State its effect on system performance.
- (c) Compare the hermetically sealed compressor with open type reciprocating compressor on following basis :
 - (i) Construction
 - (ii) Capacity
 - (iii) Application
 - (iv) Lubrication & Maintenance
- (d) Explain the Dalton's law of partial pressure in relation with conditioning of air.

3. Attempt any THREE of the following :**12**

- (a) In a refrigeration plant working on Bell Coleman cycle, air is compressed from 1 bar to 5 bar. Its initial temperature is 10 °C and after compression the air is cooled up to 20 °C in a cooler before expanding back to a pressure of 1 bar. Determine the COP of the plant and refrigerating capacity.
- (b) Compare the vapour compression refrigeration cycle with vapour absorption refrigeration cycle on following basis :
 - (i) COP
 - (ii) Components used
 - (iii) Energy input
 - (iv) Capacity
 - (v) Pressure & Temperature
 - (vi) Maintenance
 - (vii) Refrigerant used
 - (viii) Application

- (c) Explain in brief the method of estimating heat gain due to
 - (i) Sensible heat gain through building structure by conduction
 - (ii) Heat gain from occupancy
- (d) Explain with neat label sketch the working principle of simple air-cooling system used for aircraft.

4. Attempt any THREE of the following :

12

- (a) Air is dehumidified from an initial condition of 30 °C DBT and 80% RH to 25 °C DBT and 18 °C WBT. Plot the process on Psychrometric chart. Find out the –
 - (i) Specific humidity at initial condition and
 - (ii) Dew point temperature at final condition.
- (b) List the features of package type air-conditioners. State its two advantages over window type air-conditioners.
- (c) A duct system carries the conditioned air having temperature 10 °C from central air-conditioning plant to conditioned Hall. To avoid the change in temperature of air suggest the insulating material for insulation purpose. Justify the answer.
- (d) Explain with neat sketch the construction and working of flooded type evaporators. State its applications.
- (e) Explain with neat sketch the construction and working of spray type humidifier. State its application.

P.T.O.

5. Attempt any TWO of the following :**12**

- (a) An ammonia refrigerator produces 20 tones of ice at 0 °C from water at 0 °C in a day of 24 hrs. The temperature range in compressor is from – 15 °C to 25 °C. The vapour leaving compressor is dry and saturated. The liquid leaves the condenser at 25 °C and is expanded in a throttle valve. Assuming actual co-efficient of performance of the plant as 75% of the theoretical, calculate compressor power. Take the latent heat of ice as 333 kJ/kg. Use following properties of ammonia :

Temp. °C	Enthalpy kJ/kg		Entropy kJ/kg °K	
	Liquid	Vapour	Liquid	Vapour
25	100	1311	0.345	4.459
– 15	55	1297	0.212	5.029

- (b) In a particular application, it is required to maintain a constant superheat of the vapour refrigerant at the end of the evaporator coil. Suggest the expansion device for this situation. Draw a neat sketch of it. Explain its construction & working in brief.
- (c) Draw neat sketch and explain working of refrigerator. Also write its application, refrigerant used and its standard sizes.

6. Attempt any TWO of the following :**12**

- (a) In a school of 100 students, intake, needs 40 litre drinking water per day. Suggest the type of water cooler for this school. Draw the label sketch of this type of water cooler. List the names of manufacturers of it and give its broad specifications.
- (b) Suggest the duct system for 'L' shape building. Explain it with neat sketch.
- (c) An auditorium of 500 seating capacity situated in Mumbai, required to be air-conditioned. Explain the procedure of calculation of cooling load for the auditorium and suggest the proper air-conditioning system.
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