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7659

BOARD DIPLOMA EXAMINATION, (C-20)

MAY/JUNE—2023

DME - FIFTH SEMESTER EXAMINATION

REFRIGERATION AND AIR CONDITIONING

Time : 3 Hours ]

[ Total Marks : 80

**PART—A**

3×10=30

- Instructions :** (1) Answer **all** questions.  
 (2) Each question carries **three** marks.  
 (3) Answers should be brief and straight to the point and shall not exceed five simple sentences.

1. Define refrigeration and give any four applications of refrigeration. 1+2
2. Draw P-V and T-S diagrams of reversed Carnot refrigeration cycle. 1½+1½
3. What is the effect of sub-cooling on the performance of a vapour compression system? 3
4. Write any three differences between vapour compression refrigeration and vapour absorption refrigeration systems. 3
5. Write any three advantages of hermetically sealed compressor over open type compressor. 3
- \* 6. State the function of expansion device in refrigeration system and classify expansion devices. 1+2
7. Define the term effective temperature. List any four factors that govern effective temperature. 1+2
8. Define the terms (a) dew point temperature and (b) relative humidity. 1½+1½
9. State the functions of (a) fan and (b) duct in air conditioning system. 1½+1½
10. Write any six applications of air conditioning system. ½×6

**PART—B**

8×5=40

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- Instructions :** (1) Answer **all** questions.  
(2) Each question carries **eight** marks.  
(3) Answers should be comprehensive and criterion for valuation is the content but not the length of the answer.

- 11.** A refrigeration system working on Bell-Coleman cycle, the air is compressed from a pressure of 1 bar to 5 bar. Assume isentropic compression and expansion. The ratio of specific heats,  $\gamma = 1.4$ . Calculate (a) COP of the system and (b) compare this value with that of Carnot cycle if the temperatures of ambient air and cold chamber are 25 °C and 5 °C respectively. 8

**(OR)**

A refrigerating system operates on the reversed Carnot cycle between temperature limits of 30 °C and -10 °C. The capacity is to be 10 tons. Find (a) COP of the system and (b) heat rejected from the system per min. 8

- 12.** Explain the working of vapour compression refrigeration system with the aid of block diagram, T-S and P-H diagrams. 3+3+2

**(OR)**

Explain Electrolux refrigeration system with a neat diagram. 4+4

- 13.** Explain working of automatic expansion valve with a neat sketch. 4+4

**(OR)**

Explain ice plant with a neat sketch. 8

- \* **14.** Define the term human comfort and explain various factors that affect human comfort. 8

**(OR)**

Explain the sensible cooling and sensible heating processes by showing it on a psychometric chart. 8

- 15.** List out different types of air distribution systems. Explain different arrangements in ejection system. 8

**(OR)**

Explain the summer air conditioning system with a neat sketch. 8

**PART—C**

10×1=10

- Instructions :** (1) Answer the following question.  
(2) The question carries **ten** marks.  
(3) Answer should be comprehensive and the criterion for valuation is the content but not the length of the answer.

**16.** A 5-ton Freon-12 refrigeration plant has evaporator temperature of  $-5\text{ }^{\circ}\text{C}$ . The condensation takes place at  $32\text{ }^{\circ}\text{C}$  and there is no under cooling. Vapour is dry and saturation when entering the compressor. Find (a) COP of the plant and (b) mass flow rate of refrigerant.

Take the following properties of F-12 :

Pressure (bar)	Temperature $^{\circ}\text{C}$	Enthalpy, kJ/kg		Entropy of vapour, kJ/kg K
		Liquid	Vapour	
7.85	32	130.5	264.5	1.542
2.61	-5	—	249.3	1.557

Take  $C_p$  for superheated vapour =  $0.615\text{ kJ/kgK}$ .

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