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**B. E. (Seventh Semester) Examination,
April-May 2021**

(New Scheme)

(Mech. Engg. Branch)

REFRIGERATION & AIR CONDITIONING

Time Allowed : Three hours

Maximum Marks : 80

Minimum Pass Marks : 28

***Note : Attempt all questions worth 16 marks. use of
refrigeration charts, table and steam table
are allowed.***

Unit-I

1. (a) Define tonnes of Refrigeration. 2

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- (b) Briefly explain cascade system with suitable diagram. 7
- (c) Explain with sketch and working of vapour compression refrigeration cycle. 7
- (d) A Freon 22 condensing unit is specified to give 40 TR capacity of air conditioning under standard operating conditions of 40°C condensing and 5°C evaporating temperature. What would be its capacity in TR for food freezing for which the evaporator temperature is -35°C? 7

Unit-II

2. (a) What are the limitation of Carnot cycle with gas? 2
- (b) Sketch a Boot Strap regenerative system and obtain an expression for its COP. 7
- (c) Sketch the schematic of refrigeration system operating on Bell-Coleman cycle and explain its working. 7
- (d) A Bell-Coleman refrigerator operates between pressure limits of 1 bar and 8 bar. Air is drawn from the cold chamber at 9°C compressed and then it is cooled to 29°C before entering the expansion

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cylinder. Expansion and compression follows the law $PV^{1.35}=C$. Calculate the theoretical COP of the system. For air take $C_p = 1.003 \text{ kJ/kg K}$ and $\gamma = 1.4$. 7

Unit-III

3. (a) Give the name of two refrigerant which are used in vapour absorption system. 2
- (b) Describe Electrolux refrigerator system and derive the COP of a simple vapour absorption refrigerator. 7
- (c) Explain with neat-sketch the Lithium Bromide absorption refrigeration system. 7
- (d) Distinguish between Primary and Secondary refrigerants. Give the example of each categories. 7

Unit-IV

4. (a) Define Bypass factors. 2
- (b) 39.6 cmm of a mixture of recirculated room air and outdoor air enter a cooling coil at 31°C DBT and 18.5° WBT temperature. The effective surface temperature of the coil is 4.4°C. The surface area

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of the coil is such as would give 12.5 kW of refrigeration with the given entering air state. Determine the dry and wet bulb temperature of the air leaving the coil and the coil bypass factor. 14

- (c) Calculate, (i) relative humidity, (ii) humidity ratio, (iii) dew point temperature, (iv) density and (v) enthalpy of atmospheric air when the DBT is 35°C, WBT is 23°C and the barometer reads 750 mm Hg. 14

Unit-V

5. (a) Define the term Infiltration. 2
- (b) Define following :
- (i) RSHF
 - (ii) GSHF
 - (iii) ERSHF
 - (iv) Winter air conditioning system, and
 - (v) Summer air conditioning system 14
- (c) Given for a conditioned space :
- Room sensible heat gain = 20 kW
- Room latent heat gain = 5 kW

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Inside design conditions : 25°C DBT, 50% Rh

Bypass factor of the cooling coil = 0.1

The return air from the space is mixed with the outside air before entering the cooling coil in the ratio of 4:1 by weight. Determine :

- (i) Apparatus dew point
- (ii) Condition of air leaving cooling coil
- (iii) Dehumidified air quantity
- (iv) Ventilation air mass and volume flow rates
- (v) Total refrigeration load on the air conditioning plant 14