Enrolment No./Seat No_____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE- SEMESTER–VII EXAMINATION – WINTER 2025

Subject Code:3171918 Date:18-11-2025

Subject Name: Refrigeration and Air conditioning

Time: 10:30 AM TO 01:00 PM Total Marks:70

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Simple and non-programmable scientific calculators are allowed.**

Q.1 **(a)** Explain the term "Ton of refrigeration". **03**

(b) What is cascade refrigeration system? **04**

(c) How the refrigerants are classified? What are the essentials properties of a good refrigerant? **07**

Q.2 **(a)** Give alternate refrigerants for CFC's and HCFC's with justification. **03**

(b) Discuss the advantages of the dense air refrigerating system over an open air refrigeration system. **04**

(c) Explain with neat sketch of "simple air cooling system" in aircraft refrigeration and indicate the cycle in T-S diagram. **07**

OR

(c) A vapor compressor refrigerator uses methyl chloride (R-40) and operates between temperature limits of -10°C and 45 °C. At entry to the compressor, the refrigerant is dry saturated and after compression it acquires a temperature of 60°C. Find the COP of the refrigerator. The relevant properties of methyl chloride are as follows. **07**

Saturation temp in °C	Enthalpy in kJ/kg		Enthalpy in kJ/kg K	
	Liquid	Vapor	Liquid	Vapor
-10	45.4	460.7	0.183	1.637
40	133.0	483.6	0.485	1.587

Q.3 **(a)** Define and write the expression for nozzle efficiency in steam jet refrigeration system. **03**

(b) Compare Vapour absorption system and Vapour compression system. **04**

(c) What are the advantages of compound compression with intercooler over single stage compression? **07**

OR

Q.3 **(a)** State the functions of expansion device **03**

(b) Explain with neat sketch "Electrolux Refrigeration system". **04**

(c) A 10 ton ammonia vapour compression refrigeration system consists of one evaporator and two stage compression. The suction temperature is -30 °C and condensing temperature of 35 °C. Flash inter-cooling is done between two stages of compression. Find theoretic kW of each compressor and COP of the plant. **07**

Q.4 **(a)** What do you mean by Air filter? Explain the various types of Air filter. **03**

(b) Discuss the function of absorber in vapour absorption refrigeration system. **04**

(c) Explain with neat sketch LiBr – H_2O Absorption refrigeration system **07**

OR

Q.4 **(a)** Define human comfort and explain the factors which affect it. **03**

(b) What is effective temperature? What is its significance in design of air conditioning system. **04**

(c) The amount of air supplied to an air conditioned hall is 300m^3/min. The atmospheric conditions are 35°C DBT and 55% RH. The required conditions are 20°C DBT and 60% RH. Find out the sensible heat and latent heat removed from the air per minute. Also find sensible heat factor for the system. **07**

Q.5	**(a)**	Discuss effect of wall construction on cooling load.	**03**
	(b)	Describe the different materials used for duct. Classify duct	**04**
	(c)	A duct of 15m length passes air at the rate of $90m^3$/min. Assuming the friction factor as 0.005, calculate the pressure drop in the duct in mm of water when (a) the duct is circular of diameter 0.3m; and (b) the duct is of 0.3 m square cross-section.	**07**

OR

Q.5	**(a)**	What different methods are used for determining the duct sizes? Mention the advantages of each.	**03**
	(b)	Define following terms: (1) Specific Humidity (2) Dew point temperature (3) Relative Humidity (4) Degree of saturation	**04**
	(c)	With line diagram explain Central Air-conditioning system of any multi storey building	**07**

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