Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VII (NEW) EXAMINATION – WINTER 2022

Subject Code:3171918 Date:20-01-2023

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.**
5. **Use of Gas, Steam , Psychrometric chart and Refrigerant table is permitted**

			Marks
Q.1	**(a)**	Define (1) 1 TON of refrigeration (2) COP (3) Refrigerant	**03**
	(b)	Write Merit and Demerit of Air Refrigeration System.	**04**
	(c)	An air refrigeration open system operating between 100kPa and 1 MPa is required to produce a cooling effect of 2100kJ/min. Temperature of air leaving the cold chamber is -6°C and leaving the cooler is 28°C. Neglect losses in the compressor and expander. Determine: (1) Mass of air circulated per min, (2) Compressor work, Expander work, Net work done, (3) COP and Power required in kW.(Take Cp=1.005 kJ/kg K & $\gamma = 1.4$ for Air).	**07**
Q.2	**(a)**	What is cascade refrigeration system?	**03**
	(b)	Differentiate vapor compression system and vapor absorption system	**04**
	(c)	Explain and Derive the equation of COP for multi evaporator at different temperature with individual expansion valve and back pressure valve with neat sketch and P-H diagram.	**07**
		OR	
	(c)	Explain and Derive the equation of COP for multi evaporator at different temperature with multiple expansion valve and back pressure valve with neat sketch and P-H diagram.	**07**
Q.3	**(a)**	Explain in brief shell and tube condenser.	**03**
	(b)	Advantages and dis advantages of centrifugal compressor over reciprocating compressor.	**04**
	(c)	Explain Lithium Bromide absorption refrigeration system with neat sketch.	**07**
		OR	
Q.3	**(a)**	What is the main function of Evaporator in refrigeration system? List out different types of Evaporators.	**03**
	(b)	Explain in brief capillary tube and thermostatic expansion valve.	**04**
	(c)	Explain Ammonia-Water absorption refrigeration system with neat sketch.	**07**
Q.4	**(a)**	Explain in brief flywheel effect of building material.	**03**
	(b)	Define term Human comfort and Explain factor affecting human comfort.	04
	(c)	Explain with suitable example how cooling load of a confined space is calculated with load estimation sheet.	**07**

OR

Q.4 **(a)** Give classification of cooling and heating load analysis. **03**

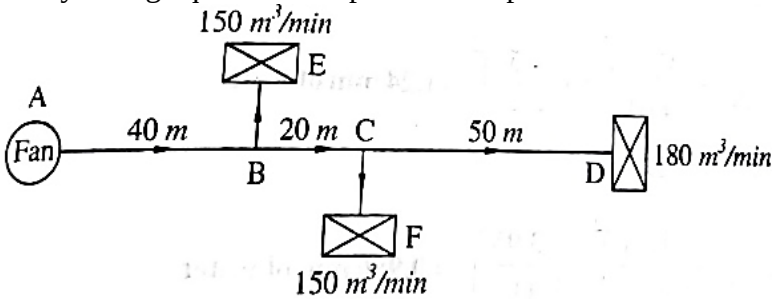
(b) Define term effective temperature and Explain factor affecting effective temperature. **04**

(c) A small office hall of 25 persons capacity is provided with summer air conditioning with following data:- Outside condition:- 34°C DBT and 28°C WBT Inside condition:- 24°C DBT and 50% RH Volume of air supply=0.4 m3/min/person Sensible heat load in room =125600 kJ/hr Latent heat load in room =42000 kJ/hr. Find sensible heat factor of room. Use Psychrometric chart. **07**

Q.5 **(a)** What do you understand by Static regain method in duct design? **03**

(b) Draw schematic diagram of summer air conditioning system. **04**

(c) A duct distribution system supplying air to a house is shown in figure below, Estimate the diameter and velocity pressure in AB,BC,CD,BE and CF by using equal friction pressure drop Method. **07**



OR

Q.5 **(a)** What do you understand by Velocity reduction method for duct design? **03**

(b) Draw schematic diagram of Winter air conditioning system. **04**

(c) Circular duct of 40 cm is selected to carry in air conditioned space at a velocity of 440 m/min to keep noise level at a desired level. If this duct is replaced by a rectangular duct of aspect ratio of 1.5. Find out size of a rectangular duct for equal friction method when (1) velocity and (2) discharge rate of air in two duct is same. **07**