Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VII (NEW) EXAMINATION – WINTER 2023

Subject Code:3171918 Date:06-12-2023

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.**

Q.1	**(a)**	Define 1) C.O.P. 2) Ton of Refrigeration. 3) Refrigerant.	**03**
	(b)	Enlist Different (any eight) Methods of cooling.	**04**
	(c)	A simple air refrigeration system is used for an airplane to take 20 tons of refrigeration load. The ambient air conditions are 20^0C and 0.9 bar. The ambient air is rammed isentropically to a pressure of 1 bar. The air leaving the main compressor at pressure 3.5 bar. Temperature of air after cooler is 88.7 ^{0}C. Cabin is to be maintained at a temperature of 25^0C and a pressure of 1.05 bar. If the internal efficiency of the compressor is 80% and that of turbine is 75%. determine 1)Mass of air bled off the main compressor. 2)C.O.P of the refrigeration system.	**07**
Q.2	**(a)**	Compare VCR (vapour compression refrigeration) and VAR (vapour absorption refrigeration).	**03**
	(b)	Compare H_2O-NH_3 and LiBr-H_2O vapour absorption refrigeration system.	**04**
	(c)	Explain with neat sketch “Cascade Refrigeration system”.	**07**
		OR	
	(c)	Explain with diagram “Multiple evaporators with back pressure valves and with multiple expansion valves without flash inter cooling refrigeration system.	**07**
Q.3	**(a)**	Which are the desirable properties of refrigerant-absorbent pair.	**03**
	(b)	Explain with neat sketch “Electrolux Refrigeration system”.	**04**
	(c)	With neat sketch, explain working of Thermostatic expansion valve.	**07**
		OR	
Q.3	**(a)**	Explain how problems of window air conditioner are mitigated by split air conditioning system?	**03**
	(b)	Explain with neat sketch “Practical H_2O -NH_3 cycle”.	**04**
	(c)	With neat sketch explain working of “evaporative condenser”.	**07**
Q.4	**(a)**	Define -Effective temperature.	**03**
	(b)	State different sensible heat load of building.(any four)	**04**
	(c)	State and explain various heat load to be considered for cooling load calculation of an automobile.	**07**
		OR	
Q.4	**(a)**	Define thermal comfort and state factors affecting thermal comfort.	**03**

	(b)	State importance of flywheel effect in designing of building air-conditioning system.	**04**
	(c)	Explain following by use of supporting formula. 1)Sensible heat gain through building structure by conduction. 2)Load due to air infiltration. 3)Load due to electric motor.	**07**
Q.5	**(a)**	Give classification of air conditioning system.	**03**
	(b)	Explain with neat sketch "Summer air conditioning system".	**04**
	(c)	A duct of 15 m length passes air at the rate of 90 m^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 0.3 m; and (b) the duct is 0.3 m square cross section.	**07**

OR

Q.5	**(a)**	Compare, Package air conditioning system and Central air conditioning system.	**03**
	(b)	Explain with neat sketch "Winter air conditioning system".	**04**
	(c)	A rectangular duct section of 500 mm x 350 mm sizes carries 75 m^3/min of air having density of 1.15 kg/m^3.Determine the equivalent diameter of a circular duct if (a) the quantity of air carried in both the cases is same, and (b)the velocity of air in both the cases is same. If f =0.01 for sheet metal, find the pressure loss per 100 m length of duct.	**07**

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