Seat No.: _____ Enrolment No.

GUJARAT TECHNOLOGICAL UNIVERSITY

BE- SEMESTER–VI (NEW) EXAMINATION – WINTER 2020

Subject Code:2161908 **Date:05/02/2021**

Subject Name:Refrigeration and Air Conditioning

Time:02:00 PM TO 04:00 PM **Total Marks: 56**

Instructions:

1. **Attempt any FOUR questions out of EIGHT questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Use of tables and charts for refrigerants and air conditioning is allowed.**

Q.1	**(a)**	What is air conditioning? Classify it.	**03**
	(b)	With neat sketch of ice plant, explain importance of brine in it.	**04**
	(c)	A refrigerator utilizing R-12 refrigerant works between temperature limits of -10°C and 30°C. It uses the single acting reciprocating compressor of 20 cm diameter and 15 cm stroke length. The compressor runs at 500 rpm with volumetric efficiency of 85%. If refrigerant is subcooled by 8 °C after condenser and superheated upto -2 °C before compressor then 1) draw the complete cycle on p-h, T-s charts, and determine using R-12 chart 2) volume flow rate per minute 3) mass of refrigerant per minute 4) cooling capacity in TR 5) COP 6) Percentage decrease in COP compare to Carnot refrigerator for same limits.	**07**
Q.2	**(a)**	Categorize different types of loads acting in restaurants.	**03**
	(b)	Explain the method to designate halocarbon and inorganic refrigerants also give one example of both.	**04**
	(c)	Explain regenerative air refrigeration system with schematic and T-s plot.	**07**
Q.3	**(a)**	Explain importance of site survey for load calculation.	**03**
	(b)	Explain processes of spraying normal water recirculation in air and mark the same on psychrometric chart.	**04**
	(c)	Explain working of an absorption refrigeration system which is unsuitable for subzero refrigeration application with neat sketch.	**07**
Q.4	**(a)**	Describe importance of any four factors affecting thermal comfort.	**03**
	(b)	Draw neat sketch of theoretical aqua ammonia refrigeration system and suggest remedies to overcome its limitations.	**04**
	(c)	Note down the factors affecting solar heat gain through wall also explain the step by step method to calculate it.	**07**
Q.5	**(a)**	List out types of compound compression refrigeration systems and need of each in brief.	**03**
	(b)	Describe working of split air conditioner with neat sketch.	**04**

	(c)	If the barometric pressure, DBT and RH of air are 98.6 kPa, 25°C and 50% respectively then calculate: 1) vapor pressure, 2) DPT, 3) WBT, 4) humidity ratio, 5) enthalpy of air, 6) degree of saturation and 7) dew point depression.	**07**
Q.6	**(a)**	Define specific humidity, dew point temperature and wet bulb depression.	**03**
	(b)	Two air streams mix in an adiabatic chamber at standard pressure. The DBT and WBT of first stream are 15°C and 13°C whereas for second stream are 25°C and 18°C respectively. If volume flow ratio of first to second stream is 2.5 and first stream flows with 30cmm then determine mass flow rate, specific humidity, DBT and WBT of air mixture.	**04**
	(c)	Explain the two stage compression refrigeration system having flash intercooler with neat schematic and p-h diagram.	**07**
Q.7	**(a)**	Draw neat sketch of all year air conditioning with clear indication of all the components.	**03**
	(b)	List out types of evaporators and explain direct expansion type evaporator.	**04**
	(c)	Mention the rules for duct design and explain equal friction method of duct design.	**07**
Q.8	**(a)**	Define volumetric efficiency, isothermal efficiency, and adiabatic efficiency of compressor.	**03**
	(b)	Explain rectangular equivalent of circular ducts and derive its formula.	**04**
	(c)	Explain variable restriction type expansion device with neat sketch.	**07**

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