Total No. of Questions: 6 *Total No. of Printed Pages:3*

Enrollment No.....

Faculty of Engineering

End Sem Examination May-2023

AU3CO16

Automotive Refrigeration & Air Conditioning

Programme: B.Tech. Branch/Specialisation: AU

Duration: 3 Hrs. **Maximum Marks: 60**

Note: All questions are compulsory. Internal choices, if any, are indicated. Answers of Q.1 (MCQs) should be written in full instead of only a, b, c or d. Assume suitable data if necessary. Notations and symbols have their usual meaning. Use of Refrigeration Tables and Psychrometric Charts permitted.

Q.1 i. The ideal energy transfer observed in compressor of a refrigerator is- **1**

(a) Isothermal work transfer
(b) Constant volume heat addition
(c) Constant pressure heat addition
(d) Isentropic work transfer

ii. The number of chlorine atoms in R134 is- **1**

(a) 0 (b) 1 (c) 2 (d) 4

iii. What is the definition of relative humidity? **1**

(a) The amount of water vapor present in the air
(b) The ratio of the partial pressure of water vapor to the vapor pressure of water at a given temperature
(c) The temperature at which air becomes saturated and condensation occurs
(d) The amount of heat required to raise the temperature of one pound of air one-degree Fahrenheit

iv. What does the dew point temperature indicate on a psychrometric chart? **1**

(a) The temperature at which air becomes saturated and condensation occurs
(b) The temperature at which air becomes superheated and dry
(c) The temperature at which air becomes compressed and dense
(d) The temperature at which air becomes ionized and conducts electricity

P.T.O.

v. What would you expect from your car AC if you are travelling in Cherrapunji? **1**
(a) Heating and humidification
(b) Heating and dehumidification
(c) Cooling and humidification
(d) Cooling and dehumidification

vi. What is meant by the term "sensible heat load" in air conditioning? **1**
(a) The heat generated by the occupants and equipment in a space
(b) The heat gained or lost through the walls, roof, and windows of a space
(c) The heat required to change the temperature of the air without changing its moisture content
(d) The heat required to change the moisture content of the air without changing its temperature

vii. Which type of air distribution system in a car AC is responsible for delivering air to the passengers? **1**
(a) Recirculation system (b) Ventilation system
(c) Blower system (d) Refrigeration system

viii. Which type of air distribution system in a car AC is responsible for utilizing already conditioned air inside the car again and again? **1**
(a) Recirculation system (b) Ventilation system
(c) Blower system (d) Refrigeration system

ix. What is the purpose of cleaning or replacing the air filter in a car's AC system? **1**
(a) To improve the performance and efficiency of the AC system
(b) To increase the amount of refrigerant needed to cool the cabin
(c) To prevent mold growth in the air conditioning system
(d) To increase the lifespan of the compressor

x. What is the purpose of evacuating and recharging the refrigerant in a car's AC system during servicing? **1**
(a) To remove any moisture or contaminants from the system
(b) To increase the cooling capacity of the system
(c) To prevent compressor damage
(d) To reduce the amount of refrigerant needed to cool the cabin

Q.2 i. Write a short note on alternative refrigerants. **2**
ii. Describe in detail the working of a practical vapour absorption refrigeration system. Support your answer with neat sketches and provide energy equations. **8**

OR iii. 1.5 kW per tonne is required to maintain the temperature of -40°C in the refrigerator working on Carnot cycle. Determine: **8**
(a) COP of cycle
(b) Temperature of the sink

Q.3 i. Define WBT. **2**
ii. Air at 35°C and 50% relative humidity is to be conditioned to 20°C and 70% relative humidity. Determine the amount of moisture that must be added or removed per kilogram of dry air. **8**
OR iii. Air at 25°C and 80% relative humidity enters a cooling coil and is cooled to 12°C at a constant volume. Determine the final relative humidity of the air. **8**

Q.4 i. What do you mean by comfort conditions? **2**
ii. Give a detailed classification of air conditioning systems, based on various parameters. Give examples and applications in each category. Suggest which type of arrangement will you prefer if you are in a car in Mumbai. **8**
OR iii. Write down the steps of heat load estimation for air conditioning of room and define RSHF. **8**

Q.5 i. What does  symbol denotes on a car dashboard? **2**
ii. Explain in detail various air distribution systems used in car AC. Support your answers with neat sketches. **8**
OR iii. What is the role of diffusers and grill in car AC system? **8**

Q.6 Write short notes on any two:
i. Compressor service in car **5**
ii. Refrigerant gas charging procedures **5**
iii. Troubleshooting of car AC problems in winter **5**

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Marking Scheme
AU3CO16 (T) Automotive Refrigeration & Air

Q.1	i)	d) Isentropic Work Transfer	**1**
	ii)	a) 0	**1**
	iii)	b) The ratio of the partial pressure of water vapor to the vapor pressure of water at a given temperature	**1**
	iv)	a) The temperature at which air becomes saturated and condensation occurs	**1**
	v)	b) Heating and Dehumidification	**1**
	vi)	c) The heat required to change the temperature of the air without changing its moisture content	**1**
	vii)	b) Ventilation system	**1**
	viii)	a) Recirculation system	**1**
	ix)	a) To improve the performance and efficiency of the AC system	**1**
	x)	a) To remove any moisture or contaminants from the system	**1**

Q.2	i.	Short note	**2**
	ii.	Description	**4**
		Diagram	**2**
		Mathematical Equation	**2**
OR	iii.	COP = 2.33	**4**
		Temperature of sink = 60°C	**4**

Q.3	i.	Definition	**2**
	ii.	Depiction on Psychrometric chart	**4**
		0.0084 kg of moisture must be removed per kg of dry air.	**4**
OR	iii.	Depiction on Psychrometric chart	**4**
			4
		final relative humidity of the air is 66.7%.	

Q.4	i.	Answer	**2**
	ii.	Classification	**6**
		Comment on AC used	**2**
OR	iii.	Steps involved (generally 4)- 2 marks each	**8**

Q.5	i.	Recirculation	**2**
	ii.	Various distribution systems	**5**
		Diagrams	**3**
OR	iii.	4 marks each	**8**

Q.6			
	i.	Short note	**5**
	ii.	Short note	**5**
	iii.	Short note	**5**

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