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

Enrollment No.....

Faculty of Engineering

End Sem Examination May-2024

AU3CO37

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.
Refrigerant table with Psychrometric Chart is permitted in the exam.

Q.1 i. Which of the following is a method of refrigeration? **1**

(a) Thermo electric (b) Evaporation
(c) Air refrigeration (d) All of these

ii. 1 TR is equal to ____ kW. **1**

(a) 3.5 (b) 210 (c) 1 (d) 4.5

iii. What does dew point temperature indicate on Psychrometric chart? **1**

(a) Temperature at which air becomes saturated and condensation occurs
(b) Temperature at which air becomes dry and superheated
(c) Temperature at which air becomes dense
(d) None of these

iv. Wet bulb depression is zero when relative humidity is _____. **1**

(a) Zero (b) 0.5 (c) 0.75 (d) 1

v. What would you expect from your car AC if you are driving in Mumbai? **1**

(a) Heating and humidification
(b) Cooling and humidification
(c) Cooling and dehumidification
(d) AC is only for producing cooling effect

vi. Sensible heat factor (SHF) is defined as the ratio of- **1**

(a) Latent heat & sensible heat
(b) Sensible heat & latent heat
(c) Sensible heat & total heat
(d) Total heat & latent heat

P.T.O.

vii. Addition of atmospheric pressure and gauge pressure is called- **1**
(a) Total pressure (b) Absolute pressure
(c) Normal pressure (d) Combined pressure

viii. The use of duct in air conditioning unit is- **1**
(a) Air cooling (b) Air heating
(c) Air cleaning (d) Air distribution

ix. Which of the following is the main motive behind maintenance of AC? **1**
(a) Improving compressor work
(b) Improving energy efficiency and performance
(c) Improving the aesthetics of AC
(d) All of these

x. Which control is responsible for regulating the temperature in an AC system? **1**
(a) Humidistat (b) Control dampers
(c) Thermostat (d) Pressure cut-outs

Q.2 i. What are the applications of refrigeration & air conditioning? **2**

ii. Define the following- **3**
(a) 1 Ton of refrigeration (b) Eco friendly refrigerants

iii. With the help of neat sketch, explain the working of vapour compression refrigeration system. **5**

OR iv. Determine the cooling rate of a refrigeration machine if the capacity of the system is 12 tons. Calculate the refrigeration effect if 250 liters of water is required per hour at 10 ℃, when the actual temperature is 30 ℃. Cp of water is 4.18 kJ/kgK. **5**

Q.3 i. Write in brief about- **4**
(a) Wet bulb temperature (b) Dry bulb temperature
(c) Sensible cooling (d) Heating and dehumidification

ii. The following is the data related to moist air- **6**
Dry bulb temperature = 30 ℃, Wet bulb temperature = 15 ℃
Total pressure is 1 bar.
Compute the value of relative humidity and specific humidity.

OR iii. 40 m^3 of air at 35°C DBT and 50% RH is cooled to 25°C DBT maintaining its specific humidity constant. Calculate: **6**
(a) RH of cooled air
(b) Heat removed from air

Q.4 i. What do you mean by the term comfort conditioning? Define RSHF and OASH. **4**

ii. Discuss the steps of heat load estimation for air conditioning of office cabin. **6**

OR iii. What is the effect of AC load of vehicle on engine performance in terms of loss of torque and fuel consumption? **6**

Q.5 i. What are the objectives of dashboard re-circulating unit? **4**

ii. Classify various air distribution systems in a car. Explain any one with neat diagram. **6**

OR iii. Explain the following- **6**
(a) Air routing (b) Automatic temperature control

Q.6 Attempt any two:

i. Explain refrigerant gas charging procedures. **5**

ii. Discuss diagnosis & troubleshooting of air conditioning systems. **5**

iii. Explain the function of common control systems like thermostats, humidistat, and control dampers. **5**

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Marking Scheme

Automotive Refrigeration & Air Conditioning (T) - AU3CO37 (T)

Q.1	i)	d) All of these		**1**
	ii)	a) 3.5		**1**
	iii)	a)Temperature at which air becomes saturated and condensation occurs		**1**
	iv)	d) 1		**1**
	v)	c) Cooling and dehumidification		**1**
	vi)	b) sensible heat & latent heat		**1**
	vii)	b) Absolute pressure		**1**
	viii)	d) Air distribution		**1**
	ix)	b) Improving energy efficiency and performance		**1**
	x)	c) Thermostat		**1**
Q.2	i.	2 marks for application (at least 4)		**2**
	ii.	1.5 marks for each definition		**3**
	iii.	Diagram	2.5 marks	**5**
		Working	2.5 marks	
OR	iv.	Cooling rate = 42 kJ/s	2.5 marks	**5**
		Refrigeration effect = 20900 kJ/h	2.5 marks	
Q.3	i.	1 mark for each definition		**4**
	ii.	Relative humidity = 0.4015	3 marks	**6**
		Specific humidity = 0.0107 kg of vapour/kg of dry air	3 marks	
OR	iii.	RH = 88- 90 % =	3 marks	**6**
		Heat removed is 11 kJ/kg of dry air =	3 marks	
Q.4	i.	Comfort conditioning =	2 marks	**4**
		RSHF and OASH =	2 marks	
	ii.	6 marks		**6**
OR	iii.	Effect on torque loss =	3 marks	**6**
		Effect on fuel consumption =	3 marks	
Q.5	i.	1 mark for each objective =	4 marks	**4**
	ii.	Classification =	2 marks	**6**
		Diagram =	2 marks	
		Explanation =	2 marks	
OR	iii.	Air routing =	3 marks	**6**
		Automatic temperature control =	3 marks	
Q.6		Attempt any two		
	i.	refrigerant gas charging procedures =	5 marks	**5**
	ii.	Diagnosis =	2.5 marks	**5**
		Troubleshooting =	2.5 marks	
	iii.	thermostats, =	2 marks	**5**
		humidistat, =	1.5 marks	
		control dampers. =	1.5 marks	

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