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

Enrollment No.....

Faculty of Engineering

End Sem (Even) Examination May-2022

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.

Q.1 i. Which statement is wrong? **1**

(a) Latent heat of fusion of ice is 80 Calorie/gm
(b) Latent heat of fusion of ice is 80 k Calorie/kg
(c) Latent heat of Fusion of ice is 336 k Joule/kg
(d) Latent heat of fusion of ice is 86 Calorie/gm

ii. One tone of refrigeration equal to- **1**

(a) 4.2 k Watt (b) 510 k Joules/min.
(c) 12000 BTU/hour (d) None of these

iii. Unit of Relative humidity is- **1**

(a) kg/kg of dry air (c) kg/kg of water vapour
(c) kg/kg of moist Air (d) None of these

iv. Psychometrics is the study of- **1**

(a) Air and water vapor mixture (b) Property of dry air
(c) Property of water vapor (d) None of these

v. Wet bulb temperature is temperature- **1**

(a) At which water vapor starts condensing
(b) At which water vapor start freezing
(c) At which Air is fully saturated
(d) None of these

vi. Liquid suction heat exchanger is used to- **1**

(a) Increase COP of refrigeration system
(b) Increase freezing temperature of refrigerant
(c) Lower down the condensing temperature
(d) None of these

P.T.O.

vii. The duct of an automobile Air conditioning works for the use of- **1**
(a) Air distribution (b) Air circulation
(c) Removal of waste air (d) All of these

viii. The conditioned air supplied to the room must have the capacity to take up_____. **1**
(a) Room sensible heat load only (b) Room latent heat load only
(c) Both (a) and (b) (d) None of these

ix. Ice formation at suction in VCR indicates- **1**
(a) High quantity of refrigerant in the system
(b) Low quantity of refrigerant in the system
(c) High condensing pressure
(d) None of these

x. Charging of refrigeration system means- **1**
(a) Filling of refrigerant in the system
(b) Removing liquid refrigerant from the condenser
(c) Cleaning of evaporator
(d) None of these

Q.2 i. Explain the functioning of steam jet refrigeration system with diagram. **2**

ii. Write down difference between vapour compression and vapour absorption refrigeration system. **3**

iii. Write down the chemical formula of R717, R22, R11, R13 and R50. **5**

OR iv. Find the COP of the vapour compression refrigeration system operating between -15 ºC and 30 ºC temperature having 3 ºC of sub-cooling, and refrigerant at suction is at saturated, assuming refrigerant used is R134 a. **5**

Q.3 Attempt any two:

i. Air sample which is having dry bulb temperature 30 ºC and relative humidity 30 %. find out its wet bulb temperature, specific humidity, dew point temperature, specific enthalpy of air, and present it on psychometric chart. **5**

ii. Define the sensible heating and sensible cooling process on psychometric chart and show the cooling and dehumidification process on psychometric chart. **5**

iii. Define the dry bulb temperature, wet, bulb temperature, dew point temperature, specific humidity and relative humidity. **5**

Q.4 Attempt any two:

i. An air conditioning system is designed under the following condition **5**
Outdoor condition = 30 ºC dbt and 75% RH
Required indoor condition = 22 ºC dbt and 70% RH
Amount of free air circulated is = 3.33 CMS
Coil dew point temperature = 30 ºC
Required conditions is first achieved by cooling and dehumidification and then by heating, estimate the,
(a) Capacity of cooling coil in tonnes
(b) Capacity of heating coil in kW.

ii. Write down the steps of heat load estimation for air conditioning of room and define RSHF. **5**

iii. Explain the type of air conditioning system and their advantages and disadvantages. **5**

Q.5 Attempt any two:

i. Explain the methods of duct sizing for carrying conditioned air to room and why ducts are generally made of rectangular of square shape. **5**

ii. What are the benefits of using diffuser for air distribution instead of grill? **5**

iii. What is the difference between supply air duct and return air duct, why ducts carrying chilled air is insulated? **5**

Q.6 Attempt any two:

i. Write down the method of leak detection in vapour compression refrigeration system. **5**

ii. Explain the method of charging refrigerants in vapour compression refrigeration system. **5**

iii. Write down the possibility of low cooling produced by VCR System. **5**

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Marking Scheme

AU3CO16 Automotive Refrigeration & Air conditioning

Q.1	i.	Which statement is wrong? (d) Latent heat of fusion of ice is 86 Calorie/gm		**1**
	ii.	One tone of refrigeration equal to- (c) 12000 BTU/hour		**1**
	iii.	Unit of Relative humidity is- (d) None of these		**1**
	iv.	Psychometrics is the study of- (a) Air and water vapor mixture		**1**
	v.	Wet bulb temperature is temperature- (a) At which water vapor starts condensing		**1**
	vi.	Liquid suction heat exchanger is used to- (a) Increase COP of refrigeration system		**1**
	vii.	The duct of an automobile Air conditioning works for the use of- (d) All of these		**1**
	viii.	The conditioned air supplied to the room must have the capacity to take up_____. (c) Both (a) and (b)		**1**
	ix.	Ice formation at suction in VCR indicates- (b) Low quantity of refrigerant in the system		**1**
	x.	Charging of refrigeration system means- (a) Filling of refrigerant in the system		**1**
Q.2	i.	Functioning of steam jet refrigeration system Diagram	1 mark 1 mark	**2**
	ii.	Any three differences b/w vapour compression and vapour absorption refrigeration system. 1 mark for each	 (1 mark * 3)	**3**
	iii.	Chemical formula of R717, R22, R11, R13 and R50. 1 mark for each	 (1 mark * 5)	**5**
OR	iv.	Find the COP of the vapour compression refrigeration system Plotting on Ph curve h1, h2, h3 COP = 2.9	 1 mark 2 marks 2 marks	**5**
Q.3		Attempt any two:		
	i.	Wet bulb temperature Specific humidity Dew point temperature Specific enthalpy of air Psychometric chart	1 mark 1 mark 1 mark 1 mark 1 mark	**5**
	ii.	Definition of sensible heating with chart Definition of sensible cooling with chart Definition of cooling and dehumidification process with chart	2 marks 2 marks 1 mark	**5**
	iii.	Dry bulb temperature Wet bulb temperature Dew point temperature Specific humidity Relative humidity	1 mark 1 mark 1 mark 1 mark 1 mark	**5**
Q.4		Attempt any two:		
	i.	(a) Capacity of cooling coil in tonnes (b) Capacity of heating coil in kW. Making both condition on chart	2 marks 2 marks 1 mark	**5**
	ii.	At least 4 steps of heat load estimation for air conditioning of room 1 mark for each (1 mark * 4) Definition RSHF	 4 marks 1 mark	**5**
	iii.	Type of air conditioning system Advantages Disadvantages	3 marks 1 mark 1 mark	**5**
Q.5		Attempt any two:		
	i.	Methods of duct sizing for carrying conditioned air to room Ducts are generally made of rectangular of square shape	3 marks 2 marks	**5**
	ii.	Any five benefits of using diffuser for air distribution instead of grill 1 mark for each	 (1 mark * 5)	**5**
	iii.	Difference between supply air duct and return air duct Ducts carrying chilled air is insulated	3 marks 2 marks	**5**
Q.6		Attempt any two:		
	i.	Method of leak detection in vapour compression refrigeration system As per the explanation		**5**
	ii.	Method of charging refrigerants in vapour compression refrigeration system As per the explanation		**5**
	iii.	Possibility of low cooling produced by VCR System As per the explanation		**5**

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