Enrollment No: _____ Exam Seat No: _____

C. U. SHAH UNIVERSITY

Winter Examination-2019

Subject Name: Vehicle Refrigeration and Air Conditioning

Subject Code: 4TE07VRA1 **Branch: B.Tech (Automobile)**

Semester : 7 **Date : 18/11/2019** **Time : 10:30 To 01:30** **Marks : 70**

Instructions:

(1) Use of Programmable calculator & any other electronic instrument is prohibited.
(2) Instructions written on main answer book are strictly to be obeyed.
(3) Draw neat diagrams and figures (if necessary) at right places.
(4) Assume suitable data if needed.

Q-1 **Attempt the following questions:** **(14)**

(a)	Why air conditioning is required in vehicle?	**(1)**
(b)	Define unit of refrigeration.	**(1)**
(c)	Define the term: Psychrometry	**(1)**
(d)	What is an isolated vehicle?	**(1)**
(e)	Write down the chemical formulae for the following refrigerant: R – 717.	**(1)**
(f)	Define the term: Relative Humidity	**(1)**
(g)	State Dalton's law of Partial Pressure.	**(1)**
(h)	What is effective room sensible heat factor?	**(1)**
(i)	State the principles of Air Distribution.	**(1)**
(j)	What is Refrigerating effect?	**(1)**
(k)	What is Global Radiation?	**(1)**
(l)	What is the function of dehumidifier?	**(1)**
(m)	Why fan is necessary in air conditioning system?	**(1)**
(n)	What is standard temperature and humidity?	**(1)**

Attempt any four questions from Q-2 to Q-8

Q-2 **Attempt all questions** **(14)**

(a) Explain simple vapour compression with neat diagram. **(07)**

(b) State the factor that should be taken while selecting the system of air conditioning. **(07)**

Q-3 **Attempt all questions** **(14)**

(a) The humidity ratio of atmospheric air at 28 °C dry bulb temperature and 760 mm of Hg is 0.016 Kg per Kg of dry air. Determine: **(07)**

1. Partial pressure of water vapour
2. Relative humidity
3. Dew point Temperature
4. Specific enthalpy
5. Vapour Density

	(b)	What are desirable characteristics of absorbent and absorbent refrigerant combination in vapour absorption refrigeration cycle?	**(07)**
Q-4		**Attempt all questions**	**(14)**
	(a)	Explain in brief testing, diagnosis and trouble shooting of air conditioning system.	**(07)**
	(b)	Explain following in brief: (I) Filters (II) Humidifiers used in air conditioning systems.	**(07)**
Q-5		**Attempt all questions**	**(14)**
	(a)	What are desirable characteristics of ideal refrigerant? Explain how refrigerants are designated.	**(07)**
	(b)	Sketch Bell column cycle on P-V and T-S.	**(07)**
Q-6		**Attempt all questions**	**(14)**
	(a)	A rectangular section 60 × 40 cm size made of sheet metal is used to carry 100 m^3/min of air having a density of 1.2 kg/m^3. Find the equipment diameter of circular duct if (a) Quantity carried if same in both the cases, (b) If the same velocity in both cases if same. Also find the pressure loss per 100-meter length of duct. Take f = 0.015 for sheet metal.	**(07)**
	(b)	List the sources of sensible and latent heat gain in a Sedan car?	**(04)**
	(c)	Explain the objectives of Air Routing & Temperature Control.	**(03)**
Q-7		**Attempt all questions**	**(14)**
	(a)	A dense air refrigeration machine operating on Bell-Coleman cycle works between 3.4 bar and 17 bar. The temperature of air after the cooler is 15℃ and after refrigeration is 6℃, for a refrigeration capacity of 6 tons calculate: 1. Temperature after compression and expansion 2. Air circulation required in cycle per minute 3. Work of compression and expansion 4. Theoretical COP 5. Rate of water circulation required in the cooler in Kg/min if rate of temperature rise is limited to 30℃	**(07)**
	(b)	What are different methods used for design of the ducts and explain advantages of each over other.	**(07)**
Q-8		**Attempt all questions**	**(14)**
	(a)	What is aspect ratio? How does it effect on the performance of air conditioning?	**(04)**
	(b)	What are Cryogenics? What is the necessity of it?	**(04)**
	(c)	Explain automobile air cooling system with neat sketch.	**(06)**