Seat No: _____ Enrollment No: _____

PARUL UNIVERSITY

FACULTY OF ENGINEERING & TECHNOLOGY

B.Tech. Summer 2018-19 Examination

Semester: 6 **Date: 04/05/2019**
Subject Code: 03102353 **Time: 10:30 to 1:00 pm**
Subject Name: Automotive Heating Ventilation and Air conditioning **Total Marks: 60**

Instructions:
1. All questions are compulsory.
2. Figures to the right indicate full marks.
3. Make suitable assumptions wherever necessary.
4. Start new question on new page.

Q.1 Objective Type Questions – **(15)**

1. What is refrigerant?
2. Define one tone of refrigeration.
3. Write down the chemical formula of R134.
4. Represent Sensible cooling processes on psychrometric chart.
5. Represent heating with humidification processes on psychrometric chart.
6. Compare refrigerant system with Heat pump.
7. Define latent heat of vaporization.
8. List out various leak detecting instruments.
9. What are the Causes of Leakage in air conditioner system?
10. List out various inorganic refrigerant used.
11. The moisture in a refrigerant is removed by
    (a) Evaporator (b) Safety Relief Valve (c) Driers (d) Dehumidifier
12. Air refrigerator works on
    (a) Carnot cycle (b) Rankine cycle (c) Bell-Coleman cycle (d) None of them
13. The heat removing capacity of one tonne refrigerator is equal to
    (a) 21 KJ/min (b) 210 KJ/min (c) 420 KJ/min (d) 620 KJ/min
14. Refrigeration in aeroplanes usually employs the following refrigerant
    (a) Co2 (b) Freon-11 (c) Freon-22 (d) Air
15. A refrigeration cycle operates between condenser temperature of + 27°C and evaporator temperature of- 23°C. calculate COP based Reverse carnot cycle.

Q.2 Answer the following questions. (Attempt any three) **(15)**

A) Explain thermodynamic, Chemical and Physical properties of refrigerants.
B) Define following term related to psychrometry (i) wet bulb temperature (ii) psychrometry (iii) Relative humidity (iv) dew point temperature (v) sensible heat factor
C) Write down fault, causes and remedies of air-conditioner compressor
D) A Carnot refrigeration cycle absorbs heat at 270 K & rejects it at 300 K.
   a. Calculate the C.O.P.
   b. If the cycle is absorbing 1130 KJ/Min at 270 K, How many KJ of work is required per second?
   c. If the Carnot heat pump operates between the same temperatures as the above refrigeration cycle, what is the COP?
   d. How many KJ/min will the heat pump deliver at 300 K if it absorbs 1130 KJ/min at 270 K.

Q.3 A) What is the function of expansion device? Explain automatic expansion valve with neat sketch. **(07)**

B) A 12 m long duct passes air at the rate of $1.2 m^3/s$. If the friction factor is 0.0048, calculate the pressure drop in the following cases: **(08)**
   (a) When the duct is circular of diameter 280 mm.
   (b) When the duct is 280 mm square section.

OR

B) Describe the testing methods to find out leakage in air conditioning system of car. **(08)**

Q.4 A) A vapour compression refrigerator works between the pressure limit of 60 bar and 25 bar. The working fluid is just dry at the end of compression. Determine C.O.P. of the cycle. Also find Capacity of refrigerator if fluid flow is at the rate of 5kg/min. **(07)**

Pressure	Saturation Temperature	Enthalpy (kJ/kg)		Entropy (kJ/kg K)	
		Liquid	Vapour	Liquid	Vapour
60	295	151.96	293.29	0.554	1.0332
25	261	56.2	322.58	.226	1.2464

OR

A) State and explain various heat loads to be considered for cooling load calculation of Vehicle. **(07)**

B) Explain with neat schematic diagram vapour compression refrigeration system also draws its T-s P-h diagram. **(08)**