

Seat No.: _____

Enrolment No. _____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER-VI(NEW) – EXAMINATION – SUMMER 2019

Subject Code:2161908

Date:29/05/2019

Subject Name:Refrigeration and Air Conditioning

Time:10:30 AM TO 01:00 PM

Total Marks: 70

Instructions:

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Use of Refrigeration Air-Conditioning charts and Steam tables is permitted

- Q.1**
- (a) What is the difference between Refrigeration & Heat pump How is the effectiveness of refrigeration system is measured. **03**
- (b) Explain the method of designation of refrigerant with example. **04**
- (c) Explain in brief simple air-refrigeration system. Show processes on T-s diagram and derive equation of COP in terms of temperatures. **07**

- Q.2**
- (a) Why air craft cooling is required? Explain. **03**
- (b) What is the effect of sub-cooling on the performance of vapour compression refrigeration system ? **04**
- (c) Explain the effect of suction pressure & delivery pressure on performance of vapour compression refrigeration using P-H & T-s diagram **07**

OR

- (c) A refrigeration machine is required to produce ice at 0°C from water at 20°C. The machine has a condenser temperature of 25°C while evaporator temperature is -5 °C. The relative efficiency of the machine is 50% and 6 kg of Freon-12 is circulated through the system per minute. The refrigerant enters in the compressor with dryness fraction of 0.6. Calculate the amount of ice produced in 24 hrs. Take latent heat of ice 335 kJ/kg **07**

Temperature (°C)	Liquid Heat (KJ/Kg)	Latent Heat (KJ/Kg)	Entropy of Liquid (KJ/Kg K)
25	59.7	138	0.2232
-5	31.4	154	0.1251

- Q.3**
- (a) Explain two physical & two thermodynamic properties of Refrigerant. **03**
- (b) State Various evaporator in use. Compare flooded and DX(dry expansion)type evaporator **04**
- (c) A single compressor using R-12 as refrigerant has three evaporators of capacity 30TR, 20TR and 10TR. The temperature in the three evaporators is to be maintained at -10 °C , 5 °C and 10 °C respectively. The condenser pressure is 9.609 bar. The liquid refrigerant leaving the condenser is sub-cooled to 30°C. The vapour leaving the evaporators is dry and saturated. Assuming isentropic compression, calculate (a) the mass of refrigerant flowing through each evaporator; (b) the power required to drive the compressor; and (c) C.O.P. of the system. **07**

OR

- Q.3** (a) Explain hermetically sealed compressor. **03**
(b) Explain construction and working of Thermostatic Expansion valve with neat sketch **04**
(c) With a diagram explain Li-BR Vapor absorption refrigeration system and write its application. **07**

OR

- Q.4** (a) What is relative humidity ? Derive its equation in terms of degree of saturation. **03**
(b) Define following term related to psychrometry **04**
1. Wet bulb temperature
2. Dry bulb temperature
3. Dew point temperature
4. Specific humidity
(c) Explain (i) Heating & humidification **07**
(ii) Cooling & Dehumidification

OR

- Q.4** (a) What is the difference between Vapour compression refrigeration & Vapour absorption refrigeration system. **03**
(b) Explain adiabatic mixing of two stream in steady flow process with Binary mixture. **04**
(c) A circular duct of 40 cm is selected to carry air in an air conditioned space at a velocity of 440 m/min to keep the noise level at desired level. If this duct is replaced by a rectangular duct of aspect ratio of 1.5, find out the size of rectangular duct for equal friction method when (a) the velocity of air in two ducts is same, (b) the discharge rate of air in two ducts is same **07**

- Q.5** (a) Explain Air Washer? **03**
(b) What is effective temperature? What factors affect effective temperature **04**
(c) State and explain various heat loads to be considered for cooling load calculations of a typical building. **07**

OR

- Q.5** (a) Explain Spray type dehumidifier. **03**
(b) List out factors governing human comfort. Define Effective Temperature **04**
(c) With line diagram explain Central Air-conditioning system of any multi storey building **07**
