PARUL UNIVERSITY
FACULTY OF ENGINEERING & TECHNOLOGY
M.Tech., Winter 2019 - 20 Examination

Semester: 1   Date: 19/12/2019
Subject Code: 203210133   Time: 10:30am to 1:00pm
Subject Name: Refrigeration & Cryogenics   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 A) Describe the Desirable properties of Ideal refrigerant. **(05)**

B) Explain the Effect of undercooling and superheating on coefficient of performance of Vapor compression machine. **(05)**

C) Describe the function of Adsorption refrigeration system with neat sketch. **(05)**

Q.2 **Answer the following questions**. (Attempt any three) (Each five mark) **(15)**
A) Explain the workng of Absorption refrigeration system.
B) List the properties of engineering materials for Cryogenic temperature.
C) Make the comparison of Linde and Claude cycles.
D) List the Applications of Low temperature Refrigeration.

Q.3 A) Explain the influence of pressure and temperature of condenser and evaporator on COP of vapor compression refrigeration system. (Draw sketch or graph if required.) **(07)**

B) In an ammonia vapour refrigeration plant, the pressure range is from 3.15 bar in the evaporator to 10.5 bar in the condenser, the compression is isentropic and before entering the throttle valve the refrigerant ammonia is sub-cooled. The temperature of refrigerant at entry and exit from the condenser is 50° C and 20° C respectively and the water being circulated in the condenser at the rate of 10.5 kg/min has a temperature rise of 10° C. The compressor unit is single cylinder/ single acting with bore 10 cm, stroke 15 cm and while running at 200 rev/min has an indicated mean effective pressure equal to 3.5 bar. If the plant forms 50 kg/hr of ice at 0^oC from water at 15^oC,

Determine:(A) COP (B) flow rate of refrigerant (C) Condition of vapour at entry to compressor. **(08)**

Take latent heat of ice as 335 kJ/kg. The relevant properties of NH_3 are as given below.

Pressure (bar)	Saturation temperature (K)	Enthalpy (kJ/Kg)		Specific heat (kJ/Kg K)	
		Liquid	Vapour	Liquid	Vapour
3.5	264	-33.6	1264	-	-
10.5	304	134	1294	4.6	2.8

OR

B) Explain Linde-Bronn system for hydrogen separation. **(08)**

Q.4 A) Discuss the balancing of vapour compression refrigeration system. **(07)**

OR

A) Discuss the cascade system with neat sketch. (with p-h & t-s chart) **(07)**

B) Write short note on "Safety against cryogen hazard". **(08)**