Registration No :

Total Number of Pages : 02 B.Tech

P2HTCC02

2nd Semester Regular / Back Examination 2018-19

REFRIGERATION ENGINEERING

BRANCH : HEAT POWER & THERMAL ENGG, HEAT POWER ENGG, THERMAL ENGG

Max Marks : 100

Time : 3 Hours

Q.CODE : F174

Answer Question No.1 (Part-1) which is compulsory, any EIGHT from Part-II and any TWO from Part-III.

The figures in the right hand margin indicate marks.

Part- I

Q1 **Only Short Answer Type Questions (Answer All-10)** **(2 x 10)**

a) What is crystallization and capacity control in vapour absorption system?
b) Mention four eco-friendly refrigerants used these days.
c) What do you mean by approach and range in cooling tower calculations?
d) Write down the effects of subcooling and superheating on the performance in refrigeration system.
e) Write the principle of liquefaction of gases.
f) Draw the actual vapor compression cycle p-h plot citing variations from ideal cycle.
g) Name four refrigerants that are suitable for ice plants.
h) Define approach and range of a cooling tower.
i) Mention the types of expansion devices used in refrigeration systems.
j) Mention desirable properties of an Ideal refrigerant.

Part- II

Q2 **Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)** **(6 x 8)**

a) Draw a neat diagram of an Ejector refrigeration system and explain its working.
b) Explain the lubrication system in refrigeration plant.
c) Briefly explain the system control balancing in refrigeration plant.
d) Explain all methods dehumidification processes of air conditioning system.
e) What factors would be considered while selecting an oversize an oversize condenser for a compressor?
f) The dry-bulb temperature and relative humidity of moist air at standard atmospheric pressure are 20°C and 30% respectively. Determine the humidity ratio, the degree of saturation, specific enthalpy and specific volume using moist air table and also by using the perfect gas relations.
g) Why is the balancing of components of the refrigeration system required? Explain briefly.
h) Explain Magnetic refrigeration system with a neat sketch.
i) Derive the following

$$\phi = \frac{\mu}{1-(1-\mu)p_s/p_b}$$

where is ϕ is relative humidity, μ is degree of saturation and p_s, p_b are saturation pressure and barometric pressure respectively.
j) What is Defrosting capacity control? Explain briefly.

k) The number of compressor cylinders, bore and stroke for a 50 ton refrigerationsystem. The bore should not exceed 100 mm and stroke is 1.1 of the bore. The operating pressure limits are 3.53 bar and 15.27 barfor R-22 system. The index of expansion is 1.1. The condensate is subcooled by 10 K before throttling. Take v_c/v_s=0.03 and rpm is 1200.

l) What do you understand by cascade systems? Explain with schematic layout.

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

Q3 In a 12 TR refrigeration ammonia plant compression is carried out in two stages with water and flash intercooling and water sub-cooling. **(16)**
Condenser pressure, evaporator pressure and flash intercooling and sub-intercooling pressures are 12 bar, 3 bar, and 6 bar respectively. If the limiting temperature for inter cooling and sub-cooling is 20° C,
determine the following:
a) The coefficient of performance of the plant;
b) The power required for each compressor;
c) The swept volume for each if the volumetric efficiency of each of the compressors is 82%.

Q4 Obtain an expression of COP of a vortex tube if the compressed air is obtained from isothermal compression in terms of pressure ratio, compression and vortex tube efficiencies. **(16)**

Q5 Show that the COP of an n-stage cascade thermoelectric refrigeration system is given by **(16)**

$$COP_{n\text{-stage}} = \frac{1}{\left(1+\frac{1}{COP'}\right)^n - 1}$$

Where *COP'* is the coefficient of performance of each stage.

Q6 Explain the design and construction details of unitary refrigeration system. Briefly discuss the thermal modelling of each equipment in it. **(16)**