Reg.No.										

MANIPAL INSTITUTE OF TECHNOLOGY
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VI SEM. B.E. ENGG. DEGREE EXAMINATIONS
MAY 2016

SUBJECT: REFRIGERATION AND AIR CONDITIONING (MME-380)
(OPEN ELECTIVE)
REVISED CREDIT SYSTEM

Time: 3 Hours. MAX.MARKS: 50

Instructions to Candidates:
- Answer **ANY FIVE FULL** questions.
- Missing data, if any, may be suitably assumed.
- Use of thermodynamics data hand book is permitted.

1A) With the help of Line diagram and T-S diagram, explain the working of simple aircraft cooling system and obtain an expression for power required to take the cooling load and C.O.P **(04)**

1B) A cold storage plant is required to store 80 tons of fish.

The temperature at which fish was supplied = 30°C

Storage temperature of fish = - 7°C

C_p of fish above freezing point = 2.94kJ/kg°C

C_p of fish below freezing point = 1.26 kJ/kg°C

Freezing point of fish = -5°C

Latent heat of fish = 250 kJ/kg

If the cooling is achieved within 7 hours, find:

a) Capacity of the refrigerating plant in Tons

b) Carnot COP

c) If actual COP = 40% of maximum, find the power required to drive the system.

(06)

2A) Describe with the help of schematic and P-h diagrams, the working of a

vapour absorption refrigeration system and obtain an expression for its maximum COP **(04)**

2B) A vapour compression refrigerator uses R-12 as refrigerant and the liquid evaporates in the evaporator at – 15^0C. The temperature of the refrigerant at the delivery from the compressor is 15^0C when the vapour is condensed at 10^0C. Find the coefficient of performance if;

i) There is no undercooling

ii) The liquid is cooled by 5^0C before expansion

Take the specific heat of liquid refrigerant as 0.94kJ/kg K **(06)**

3A) Explain with T-S diagram, the different methods to improve the COP of standard vapour compression refrigeration system **(04)**

3B) The following data refer to a two stage compression ammonia refrigeration system with water intercooler.

Condenser pressure = 14 bar

Evaporator pressure = 2 bar

Intercooler pressure = 5 bar

Load on the evaporator= 2 Ton

If the temperature of the de-superheated vapour and sub-cooled liquid refrigerant are limited to 30^0C, find;

i) The power required to drive the system

ii) COP of the system. **(06)**

4A) With a neat sketch, explain the working of summer air conditioning system **(04)**

4B) The atmospheric air at 30^0C DBT and 75% RH enters a cooling coil at the rate of 200 m^3/min. The coil dew point temperature is 14^0C and the by-pass factor of the coil is 0.1. Determine;

i) The temperature of air leaving the cooling coil

ii) The capacity of the cooling coil in tonnes of refrigeration

iii) The amount of water vapour removed per minute

iv) The sensible heat factor for the process **(06)**

5A) What are the desirable properties of an ideal refrigerant. What are the advantages and disadvantages of synthetic refrigerants **(04)**

5B) 300 m^3/min of air is supplied from outdoor conditions of 40^0C DBT and 26^0C WBT to an air conditioned room. The air is dehumidified first by a cooling coil of bypass factor 0.32 and dew point temperature 15^0C and then by a chemical dehumidifier. Air leaves the chemical dehumidifier at 30^0C DBT. Air is then passed over a cooling coil whose surface temperature is 15^0C and by-pass factor 0.26. Calculate the capacities of the two cooling coils and the dehumidifier. **(06)**

6A) Define the following terms and explain their significance in Air conditioning systems.

i) Wet bulb temperature ii) Dew point temperature iii) By-pass factor of coil iv) Sensible heat factor **(04)**

6B) A Bell-Colemen refrigeration cycle works between the pressure limits of 4 bar and 16 bar. The heat extracted by the system is 126 MJ per hour. The air enters the compressor at 5^0C and into the expander at 20^0C. Assuming that the unit runs at 300 RPM,find;

i) Power required to run the unit **(06)**

ii) Refrigerating capacity in tonnes of ice at 0^0C per day