Printed Pages: 02 **Sub Code:EME 604**

Paper Id: 140236 **Roll No.** | | | | | | | | | | |

B TECH

(SEM-VI) THEORY EXAMINATION 2018-19

REFRIGERATION & AIR CONDITIONING

Time: 3 Hours ***Total Marks: 100***

Note: 1. Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1. Attempt *all* questions in brief. 2 x 10 = 20

a. Differentiate open and closed air refrigeration system.

b. Explain Dry air rated temperature (DART)

c. What is the effect of sub-cooling process on the performance of simple vapour compression refrigeration cycle?

d. What is the function of rectifier in absorption system?

e. How does an actual vapour compression cycle differ from that of a theoretical cycle?

f. What is an azeotrope?

g. Write the chemical formula of R-114 and R-718.

h. What is wet bulb depression?

i. What do you mean by dew point temperature?

j. Write the functions of capillary tube.

SECTION B

2. Attempt any *three* of the following: 10x3=30

a. In an open cycle air refrigeration machine, air is drawn from a cold chamber at -2º C and 1 bar and compressed to 11 bar. It is then cooled at this pressure, to the cooler temperature of 20º C and then expanded in expansion cylinder and returned to the cold room. The compression and expansion are isentropic and follows the law $pv^{1.4}$= constant. Sketch the *p-v* and *T-s* diagrams of the cycle and for a refrigeration of 15 tonnes. Determine: 1) theoretical C.O.P., 2) rate of circulation of the air in kg/min, and 3) piston displacement per minute in the compressor and expander.

b. What is multi-stage vapour compression refrigeration system? Compare it with cascade refrigeration system.

c. What is a refrigerant? Distinguish between primary and secondary refrigerant. Give example of each category.

d. Define the terms:
(i) Dew point temperature
(ii) Specific humidity
(iii) Relative humidity
(iv) Degree of saturation

e. What are the different types of expansion devices generally used in refrigeration system? Describe thermostatic expansion valve with neat sketch.

SECTION C

3. Attempt any *one* part of the following: 10x1=10

a. An air refrigerator working on bell Coleman cycle operates between 1 MPa and 100 KPa is required to produce a cooling effect of 2000kJ/min. The temperature of air leaving the cold chamber is -5^0C and at leaving the cooler is 30^0C. Determine-
(i) mass of air circulated per hour
(ii) Compressor work and Expander work
(iii) COP of the system.

b. The cock pit of a jet plane flying at a speed of 1200Km/hr is to be cooled by a simpleAir cooling system. The cockpit is to be maintained at25^0C and the pressure in the cockpit is 1 bar. The other available data is as follows;

Cockpit cooling load=10TR
Ambient air pressure & temp = 0.85 bar, 30^0 C
Ram efficiency = 90%
Pressure ratio in the main compressor = 4
Pressure drop in the heat exchanger = 0.5bar
Isentropic efficiency of main compressor and cooling turbine 80%
Temp of air entering the cooling turbine = 60^0 C
Pressure loss between the cooler turbine and cockpit=0.2 bar.
Find- (a) the quantity of air passed through the cooling turbine.
(b) C.O.P of the system.
Take γ =1.4 and Cp=1kj/Kg K

4. Attempt any *one* part of the following: 10x1=10

a. In a vapour compression refrigeration system using R-12, the evaporator pressure is 1.4bar and the condenser pressure is 8 bar. The refrigerant leaves the condenser sub-cooledto 30oC. The vapour leaving the evaporator is dry and saturated. The compressionprocess is isentropic. The amount of heat rejected in the condenser is 13.42 MJ/min.Determine: 1) refrigerating effect in kJ/kg, 2) refrigerating load in TR, and 3) C.O.P.

b. Explain three stage compressions with flash intercoolers with p-h diagram.

5. Attempt any *one* part of the following: 10x1=10

a. Draw a neat labelled sketch of a Practical Vapour Absorption refrigeration cycle and explain its working in brief.

b. Explain Li-Br vapour absorption refrigeration system with neat sketch.

6. Attempt any *one* part of the following: 10x1=10

a. The atmospheric air at 30^0 C dry bulb temperatures and 75% relative humidity enters a cooling coil at the rate of 200 m^3/min. The coil dew point temperature is 14^0 C 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 tones of refrigeration and in kilowatt
(iii) The amount of water vapour removed per minute; and
(iv) the sensible heat factor for the process.

b. What is psychrometric chart? With the help of psychrometric chart describe the following process
(i) Cooling and dehumidification
(ii) Heating and humidification

7. Attempt any *one* part of the following: 10x1=10

a. Describe a cold storage in brief? What factors are considered in design of a cold storage?

b. Write the function of compressor in refrigeration system? What do you understand by hermetic sealed compressors give its advantages with diagram.