Printed Pages: 6 NME-604/EME-604

(Following Paper ID and Roll No. to be filled in your Answer Books)

Paper ID : 140614 Roll No. | | | | | | | | | |

B.TECH.

Theory Examination (Semester-VI) 2015-16

REFRIGERATION & AIR CONDITIONING

Time : 3 Hours *Max. Marks : 100*

Note: 1. Use of Refrigereant table & Psychometric chart is permitted.

2. Assume any missing data, suitable.

Q1. Attempt all question. **(2×10=20)**

a) What do you understand by term DART?

(b) Discuss the nomenclature used for classifying refrigerants.

(c) List psychometric properties of air.

(d) List various sources of heat load.

(e) What are engineering applications of cryogenics?

(f) Discuss effect of moisture and oil miscibility in refrigerants.

(g) What is sensible heat factor?

(h) Differentiate between Natural and Mechanical refrigeration.

(i) What is boot strap aircraft refrigeration Systems?

(j) Define 'Energy performance ratio (EPR) & express its Relationship with 'COP'.

Q2. Attempt any five **(5×10=50)**

(a) Refrigerating machine working between the temperature limits of -13°C and 37°C and has 90% relative COP. It consumes 4.8 kW power. Determine TR capacity. For same TR capacity, how much power will be consumed by Carnot refrigerator? Also for the same power consumption, determine TR capacity of Carnot refrigerator operating between same temperature limits.

(b) Draw a labelled sketch and explain working of window air conditioning system?

(c) Explain with neat sketch the various losses in the duct?

(d) Describe the different method of air conditioning duct design. Why are damper are required in some system.

(e) In a gas cycle refrigeration system working on Joule cycle, the outlet temperature from the cold space is 270 K and the temperature at inlet to turbine is 318 K. The pressure ratio is 4.0. Determine the mass flow rate, heat rejection, compressor work, turbine work, COP and the volume flow rates at inlet to compressor and at outlet of turbine for a system of 1 TR cooling capacity. The working substance is air.

(f) Explain simple air refrigeration system in detail with COP expression.

(g) 10 grams of moisture per kg of dry air is removed from atmospheric air when it is passed through an air conditioning system and its temperature becomes 20°C. The atmospheric conditions are 40° C DBT and 60% RH.

Find the following for the conditioned air

i. Relative humidity

ii. Wet-bulb temperature

iii. Dew point temperature

iv. Enthalpy change for the air

Assume standard atmospheric pressure.

h) $800m^3$ /min of re-circulated air at 22° C (DBT) and 10°C dew point temperature is to mixed with 300 m^3 / min of fresh air at 30°C (DBT) and 50% RH. Determine the enthalpy, specific volume, humidity ratio and dew point temp of the resultant mixture

Attempt any two **(2×15=30)**

Q3. A boot strap cooling system of 12 TR capacity is used in an aeroplane. The ambient air temperature and pressure are 20° C and 0.85 bar respectively. The pressure of air increases from 0.85 bar to 1 bar due to ramming action of air. The pressure of air discharged from the compressor is 3 bar. The pressure of air from auxiliary compressor is 4 bar. Isentropic

efficiency of turbine is 80%, 50% of the enthalpy of air discharged from the main compressor is removed in the first heat exchanger and 30% of enthalpy of air discharged is removed in the second heat exchanger using ram air. Assuming ram action to be isentropic, the required cabin pressure is 0.9 bar and the temperature of air leaving the cabin as 20°C. Find:

i. Power required to operate the system.

ii. COP.

Q4. Discuss different cooling loads for airconditioning of building. Also Discuss Effective sensible heat factor (ESHF).

Q5. A R-12 vapour compression refrigeration system has a condensing temperature of 50°C. The refrigeration capacity is 7 tons. The liquid leaving the condenser is saturated liquid and compression is isentropic. Determine

i. Refrigerant flow rate

ii. Power required to run the compressor

iii. COP of the system

Take enthalpy at the end of isentropic compression = 210 KJ/Kg Take following properties of R-12

TEMPERATURE IN °C	ENTHALPY (KJ/KG)	
	LIQUID	VAPOUR
50	84.868	206.298
0	36.022	187.397