Paper Code & Roll No. to be filled in your Answer Book

Roll No. | | | | | | | | | | | |

B.Tech. (VI - Sem.)

Even Semester Examination - 2016

REFRIGERATION & AIR-CONDITIONING

[Time : 3 Hours] *[Maximum Marks :100]*

Note: Attempt **ALL** questions. All questions carry **equal** marks. Use of steam tables, refrigerant properties tables and charts is permitted.

Q:1. Attempt **any four** of the following: (5×4=20)

(a) What do you understand by refrigeration? Define the terms

(i) Unit of refrigeration

(ii) Refrigeration effect

(iii) C.O.P.

(b) What are the limitations of Carnot refrigeration cycle?

(c) A scientist claims to have developed a refrigerator which maintain a freezer temperature of -15°C in a room whose

temperature is 35°C and have C.O.P. of 6.5. Justify whether his claim is true or false.

(d) Differentiate between closed air refrigeration system and open air refrigeration system. Discuss the advantages of closed air refrigeration system over an open air refrigeration system.

(e) What is the method of air refrigeration systems?Explain the working of simple air refrigeration system. When you will use this system in aircraft?

Q 2. Attempt **any four** of the following: (5×4=20)

(a) With the help of P-h diagram explain the effect of the following on the performance of a vapour compression refrigeration system.

(i) Evaporator pressure

(ii) Condenser pressure

(iii) Suction pressure

(iv) Liquid subcooling

(b) What is a refrigerant? ? Enumerate the desired properties of refrigerants giving two examples of common refrigerants.

(c) What are the different types of expansion devices generally used in refrigeration system? Describe any one of them in brief.

(d) In a simple vapour compression refrigeration system using R-12 as refrigerant, the evaporator and condenser temperatures are -10°C and 35°C respectively. If the capacity of the system is 15 tons, and the compression is isentropic, calculate the following with the help of P-H chart for R-12:

(i) Mass of refrigerant to be circulated.

(ii) Power required in the compressor

(iii) Total heat rejected in the condenser, and

(iv) C.O.P. of the cycle.

(e) Explained the advantage of multistage compression refrigeration system with intercooling?

Q 3. Attempt **any two** of the following: (10×2=20)

(a) Describe the operation of lithium bromide absorption system with the help of a neat labeleddiagram. Comment on possibility of utilizing solar energy for the purpose of refrigeration couple with this system.

(b) In an absorption refrigeration system, heating,cooling and refrigeration takes place at the temperature of 120°C, 30°C, and -10°C. Find

(i) Ideal C.O.P. of system

(ii) If heating temperature is increased to 160°C and refrigeration temperature is decreased to -20°C, find the percentage change in ideal C.O.P.

(c) Define DART (Dry air rated temperature). How it varies with the speed of aircraft for common aircraft refrigeration systems with graph.

Q 4. Attempt **any two** of the following: (10×2=20)

(a) Define the following terms with the help of T-s diagram

(i) Dew point temperature

(ii) Degree of saturation

(iii) Wet bulb temperature

(iv) Apparatus dew point temperature

(b) 30m^3/min of a stream of moist air at 15°C DBT and 13°C WBT are mixed with 12m^3/min of a second stream at 25°C DBT and 18°C WBT.

Barometric pressure is one standard atmosphere. Determine the dry bulb and wet bulb temperatures of the resulting mixture.

(c) Briefly explain the different modes of heat rejection from human body.

Q 5. Attempt **any two** of the following: (10×2=20)

(a) What are the different types of compressors used in refrigeration system? What are advantages and dis advantages of centrifugal compressor over reciprocating compressor.

(b) Describe various types of Cooling Towers with the help of neat sketch.

(c) The following data refer to air conditioning of public hall:

Outdoor conditions = 40°C DBT, 20°C WBT

Required comfort conditions = 20°C DBT, 50% RH

Seating capacity of hall = 1000

Amount of outdoor air supplies = 0.3 m^3/min person

If the required condition is achieved first by adiabatic humidifying and then cooling, find:

(i) The capacity of the cooling coil and surface temperature of the coil if the by-pass factor is 0.25 and

(ii) The capacity of the humidifier and its efficiency.

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