

Code No: 126AM

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B.Tech III Year II Semester Examinations, May - 2016

REFRIGERATION AND AIR CONDITIONING

(Mechanical Engineering)

Time: 3 hours

Max. Marks: 75

Note: This question paper contains two parts A and B.

Part A is compulsory which carries 25 marks. Answer all questions in Part A. Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

PART - A

(25 Marks)

- 1.a) Distinguish between Engine and Refrigerator. [2]
- b) What is the difference between expander and compressor? [3]
- c) State the various types of evaporations used in refrigeration and air conditioning systems. [2]
- d) Explain about recuperation. [3]
- e) What are the properties of ideal refrigerant? [2]
- f) Differentiate between expansion cylinder and expansion valve. [3]
- g) What is the meaning of air conditioning? [2]
- h) Explain the relation between wet bulb temperature, sensible heaters, sensible cooling. [3]
- i) Explain how to calculate load on occupants. [2]
- j) Explain infiltration load. [3]

PART - B

(50 Marks)

2. A Carnot refrigerator operates between the temperatures of -50°C and 50°C . Determine COP of the refrigerator. If the COP is to be made 4 by changing the temperatures such that increase or decrease in upper temperature is equal to decrease or increase in lower temperature, determine the new temperatures. [10]

OR

3. A refrigerator working on Bell – Coleman cycle operates between pressure limits of 1.05 bar and 8.5 bar. Air is drawn from the cold chamber at 10°C . Air coming out of compressor is cooled to 30°C before entering the expansion cylinder. Expansion and compression follow the law $p.v^{1.35} = \text{constant}$. Determine C.O.P. of the system. Take $\gamma = 1.4$ and $C_p = 1 \text{ kJ/kg -k}$ for air. [10]

4. Explain with neat sketch the working principle of a screw compressor. [10]

OR

5. Explain with a neat sketch the working principle of Evaporative condenser. [10]

6. In an absorption type refrigerator, the heat is supplied to NH_3 generator by condensing steam at 2 bar and 90°C dry. The temperature to be maintained in the refrigerator is -5°C . The temperature of the atmosphere is 30°C . Find the maximum C.O.P. is 70% of the refrigerator. If the refrigeration load is 20 tons and actual C.O.P. is 70% of maximum C.O.P. Find the mass of steam required per hour. [10]

OR

7. Draw a neat line diagram of Electrolux refrigerator and explain its working principles. What is the important role of hydrogen in this refrigeration system? [10]
8. A four rows coil with a face velocity of 150 m/min has a contact factor of 0.85. Calculate the contact factors for the following cases:
a) Face velocity 200 m/min and four rows.
b) Face velocity 100 m/min and four rows
c) Face velocity 150 m/min and eight rows
d) Face velocity 150 m/min and two rows. [10]

OR

9. A stream of moist air at 2⁰C dry bulb and 80 per cent relative humidity mixes with another stream of moist air at 30⁰C dry bulb and 10⁰C dew point in the ration by mass of one part of the first to two parts of the second. Calculate the temperature and specific humidity of the air after mixing. [10]
10. A spray cooling oil is chosen to operate under the following conditions:
Air –inlet condition28⁰C DBT and 21⁰C WBT
Air-outlet conditions.....10⁰C DBT and 6⁰C WBT
Total amount of air flow 2000 m³/min.
The chilled water inlet and outlet temperatures area 7⁰C and 12⁰C respectively
Find the following:
a) The cooling load on the coil.
b) Water flow rate through the coil. [5+5]

OR

11. Differentiate between Central, District and Unitary air-conditioning systems. [10]

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