R20 Regulation *Subject code: 3E6CC*

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

(Autonomous, Accredited by NAAC with 'A' Grade)

B.Tech VI Semester Regular Examinations, June/July 2023

REFRIGERATION AND AIR CONDITIONING

(Mechanical Engineering)

Maximum Marks: 70 Date:30.06.2023 Duration: 3 hours

Part-A

All the following questions carry equal marks (10 x 2M=20 Marks)

1 Mention the limitations of Bell Coleman air refrigeration cycle.
2 Why is refrigeration required in aircrafts?
3 What is the effect of superheating on COP?
4 List the components of a simple vapour compression refrigeration system.
5 State the functions of absorber in a vapor absorption system.
6 Compare vapor compression and vapor absorption refrigeration system.
7 Define relative humidity.
8 What is degree of saturation? Mention its unit.
9 Classify the air filters used in air conditioning.
10 Give the three methods commonly used for duct design.

Part-B

Answer All the following questions. (10MX 5=50Marks)

11 In a refrigerator working on Bell Coleman cycle, the air is drawn into the cylinder of the compressor from the chamber at a pressure of 1.03 bar and temperature of 12°C. After isentropic compression to 5.5 bars, the air is cooled at constant pressure to a temperature of 22°C. The polytrophic expansion $PV^{1.25}$ = constant, then follows and the air expanded to 1.03 bar is passed to cold chamber. Determine (a) Work done per kg of air flow (b) refrigerating effect per kg of air flow (c) COP (d) Refrigerating capacity of the plant in tonnes for a mass flow rate of 90 kg/h. For air, take γ =1.4 and Cp=1.003kJ/kgK. (10 marks)

OR

12 Draw a neat sketch of T-S & P-H diagram for a sub cooling condition for the refrigerator of a vapour. (10 marks)

13 (a) Explain the effect of evaporator pressure and condenser pressure on the performance of vapour compression refrigeration system, using P-h diagram. (5 marks)
(b) Discuss the effect of sub-cooling on COP. Would you desire large sub-cooling? Why. (5 marks)

OR

14 Describe the vapor compression refrigeration cycle, step by step using a schematic representation. (10 marks)

15 (a) Describe the layout of Li-Br absorption system. (7 marks)
(b) List the important thermodynamic requirements of refrigerant-absorbent mixture. (3 marks)

OR

16 Draw a neat diagram of steam jet refrigeration system and explain its working. (10 marks)

17 A coffee shop is to be air-conditioned. The room temperature was measured by sling psychomotor. It was observed that dry bulb temperature and relative humidity were 22°C and 30%. Calculate the specific humidity, relative humidity, vapour density, dew point temperature and enthalpy of room air with help of psychometric chart for better design of AC system. (10 marks)

OR

18 (a) Air at 25°C, 70% RH and 1 bar is compressed to 2 bar and cooled back to 25°C. Find water condensation per kg of air. (5 marks)

(b) Define the terms: (i) DBT (ii) RH (iii) WBT (iv) SHF and show them on a psychrometric chart. (5 marks)

19 The following data refers to summer air conditioning of a building. (10 marks)
Outside design condition = 43°C DB, 27°C WB
Inside design condition = 25°C DB, 50%RH
RSH = 84 MJ/h, RLH = 21 MJ/h, Bypass factor = 0.2, The room air from the room is mixed with fresh air before entering the coil in the ratio of 4:1 by mass, Determine the following:

(a) Coil ADP
(b) Condition of air entering and leaving the coil.
(c) Capacity of the coil in TR.

OR

20 Discuss the following, related to air conditioning
(a) Temperature and humidity sensors (b) air distribution system. (3+3+4 marks)