



R20 Regulation

Subject code:3E6CC

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech VI Semester Regular/Supplementary Examinations, July 2024

**REFRIGERATION AND AIR CONDITIONING
(Mechanical Engineering)**

Maximum Marks: 70

Date:26.07.2024 Duration: 3 hours

- Note: 1.This question paper contains two parts A and B.
 2. Part A is compulsory which carries 20 marks. Answer all questions in Part A.
 3. Part B consists of 5 Units. Answer any one full question from each unit which carries 10M.
 4. Each question carries 10 marks and may have a, b, c, d as sub questions.

REFRIGERATION DATA BOOK AND PSYCHROMETRIC CHART IS ALLOWED

Part-A		CO	Bloom Tx
All the following questions carry equal marks (10x2M=20 Marks)			
1	What is refrigerant? Give examples of commonly used refrigerant.	CO1	I
2	Write the advantages of dense air refrigerating systems over open air refrigerating systems.	CO1	II
3	List the components of vapour compression refrigeration system.	CO2	I
4	Would you desire large sub-cooling in vapour compression refrigeration systems? Why?	CO2	II
5	Mention the advantages of vapour absorption refrigeration system.	CO3	I
6	Write the basic principle of steam jet refrigeration system.	CO3	I
7	Define relative humidity.	CO4	I
8	What is an adiabatic saturation process?	CO4	I
9	Differentiate refrigeration and air-conditioning.	CO5	II
10	What is the purpose of ventilation in air-conditioning system?	CO5	I
Part-B			Bloom Tx level
Answer All the following questions. (5X10M=50Marks)			
11	A Bell-Coleman refrigerator operates between pressure limits of 1 bar and 8 bar. Air is drawn from the cold chamber at 9°C, Compressed and then it is cooled to 29°C before entering the expansion cylinder. Expansion and compression follows the law $PV^{1.35}=\text{constant}$. Calculate the theoretical COP of the system. For air take adiabatic index as 1.4 and $C_p=1.003 \text{ kJ/kg.K}$ [10]	CO1	IV
OR			
12	Discuss with a neat sketch, the “boot-strap air cooling system” in aircraft refrigeration and indicate the cycle in T-S diagram. [10]	CO1	III
13	Explain the effect of change in the following operating conditions on the performance of vapour compression refrigeration cycle using p-h chart. (i) Evaporator pressure (ii) Condenser pressure. [10]	CO2	IV
OR			

14	A simple saturation cycle using F12 is designed for taking a load of 10 tons. The refrigerator and ambient temperatures are -10°C and 30°C respectively. A minimum temperature difference of 5°C is required in evaporator and condenser for heat transfer. Find: (i) mass flow rate through the system, (ii) power required in kw (iii) cylinder dimensions assuming $L/D = 1.2$ for single cylinder, single acting compressor if it runs at 300 rpm with volumetric efficiency = 0.9. [10]	CO2	IV
15	Draw a neat diagram of Ammonia water vapour absorption refrigeration system and explain its working. List-out the major fields of applications of this refrigeration system. [10]	CO3	III
	OR		
16	A Two stage ammonia refrigeration system operates between overall pressure limits of 15 bar and 2 bar respectively. The liquid is sub-cooled to 30°C . The temperature of superheated vapour leaving the water intercooler is also 30°C . The flash chamber separates the dry vapor at 5 bar pressure. The liquid refrigerant then expands to 2 bar, the evaporator pressure. The load on the evaporator is 50 kW. Calculate (i) Mass flow rate in different lines (ii) Power required (iii) COP. [10]	CO3	IV
17	In a meeting room, $800\text{ m}^3/\text{min}$ of recirculated air at 22°C DBT and 10°C dew point temperature is to be mixed with $300\text{ m}^3/\text{min}$ of fresh air at 30°C DBT and 50 % RH. Determine the enthalpy, specific volume, humidity ratio and dew point temperature of mixture. [10]	CO4	IV
	OR		
18	List out the various psychrometric properties of air and explain each of them. [10]	CO4	III
19	A. Describe a centrifugal fan with the help of a neat sketch. [5] B. Explain the working of different filters and grills with the help of line diagrams. [5]	CO5	III
	OR		
20	For hot and dry weather conditions, show the arrangement of summer air-conditioning system and represent the processes on psychrometric chart. [10]	CO5	IV