



R20 Regulation

Subject code: 3E6CC

# TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech VI Semester Supplementary Examinations, February 2024

## REFRIGERATION AND AIR CONDITIONING

(Mechanical Engineering)

Maximum Marks: 70

Date: 22.02.2024 Duration: 3 hours

### Part-A

All the following questions carry equal marks

(10X2M=20Marks)

		CO	Bloom Tx
1	What is the difference between refrigeration and air conditioning?	CO1	L1
2	List the desirable properties of a refrigerant.	CO1	L1
3	What is an evaporator?	CO2	L1
4	Name the principle components of a vapour compression refrigeration cycle.	CO2	L1
5	State the functions of generator and analyzer in a vapour absorption system.	CO3	L1
6	Give two examples of ideal refrigerant-absorbent combinations.	CO3	L1
7	Differentiate between specific humidity and relative humidity.	CO4	L1
8	What is By pass factor?	CO4	L1
9	What are the methods of air cleaning in air conditioning?	CO5	L1
10	Give the various losses in ducts of air conditioning system.	CO5	L2

### Part-B

Answer All the following questions.

(5X10M=50Marks)

11	A refrigerating machine of 6 tonnes capacity working on Bell-Coleman cycle has an upper limit of pressure of 5.2 bar. The pressure and temperature at the start of compression are 1 bar and 16°C respectively. The compressed air is cooled at constant pressure to a temperature of 41°C, enters the expansion cylinder, assuming both expansion and compression processes to be isentropic with $\gamma = 1.4$ , Calculate the following: Coefficient of performance, Quantity of air in circulation per minute, Piston displacement of compressor and expander, Bore of compressor and expansion cylinders (The unit runs at 240 rpm and is double acting, Stroke length is 200 mm) and Power required to drive the unit. For air, take $\gamma = 1.4$ , and $C_p = 1.003$ kJ/kg K. (10 marks)	CO1	L2
OR			
12	Write short notes on the following: a) COP and Tonnes of refrigeration (3 marks) b) Aircraft refrigeration systems. (7 marks)	CO1	L2
13	a) Explain the methods of improving the COP of simple compression refrigeration cycle. (5 marks) b) State the effects of suction pressure and discharge pressure on performance of vapour compression system. (5 marks)	CO2	L2
OR			
14	Describe the layout of a vapour compression refrigeration system. Include P-V and T-S diagrams. (10 marks)	CO2	L2

15	Explain the working of Electrolux refrigerator with a neat layout. Mention its advantages and disadvantages. (10 marks)	CO3	L2
OR			
16	Derive an expression for COP of an ideal vapour absorption system in terms of temperature $T_G$ at which heat is supplied to the generator, the temperature $T_E$ at which heat is absorbed in evaporator and the temperature $T_C$ at which heat is discharged from condenser and absorber. (10 marks)	CO3	L2
17	A conference room for seating 100 persons is to be maintained at 22°C dry bulb temperature and 60% relative humidity. The outdoor condition is 40°C dry bulb temperature and 27°C wet bulb temperature. The various load in the auditorium are as follows: Sensible and latent heat loads per person: 80 W and 50 W respectively. Lights and fans: 15000 W. Sensible heat gain through glass, wall, ceiling etc.: 15000 W. The air infiltration is 20 m <sup>3</sup> /min. Two-third of re-circulated room air and one-third of fresh air are mixed before entering the cooling coil. The by-pass factor of the coil is 0.1. Determine apparatus dew point, the grand total heat load and effective room sensible heat factor. (10 marks)	CO4	L3
OR			
18	A stream of warm air with a dry-bulb temperature of 40°C and a wet-bulb temperature of 32°C is mixed adiabatically with a stream of saturated cool air at 18°C. The mass flow rates of the warm and cool air streams are 8 kg/s and 6 kg/s respectively. Assuming a total pressure of 1 atm, determine the (a) temperature (b) specific humidity and (c) relative humidity of mixture. (10 marks)	CO4	L3
19	A circular duct of diameter 40 cm is selected to carry air in an air-conditioned space at a velocity of 440 m/min to keep the noise level at desired level. If this duct is replaced by a rectangular duct of aspect ratio of 1.5, find out the size of rectangular duct for equal friction method when (a) the velocity of air in two ducts is same (b) the discharge rate of air in two ducts is same. (10 marks)	CO5	L3
OR			
20	Describe the working of winter air conditioning system, with a neat diagram. (10 marks)	CO5	L2