R20 Regulation *Subject code: 3E6CC*

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech VI Semester Supplementary Examinations, April 2026

REFRIGERATION & AIR CONDITIONING

(ME)

Maximum Marks: 70 Date: 21.04.2026 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.
4. Each question carries 10 marks and may have a, b, c, d as sub questions.

Part-A

All the following questions carry equal marks (10X2M=20 Marks)		Marks	CO	BTL
1	Define the refrigeration process.	2M	1	L1
2	List out the various processes in Vapor compression refrigeration cycle .	2M	1	L1
3	What is the purpose of a compressor in Vapor compression refrigeration cycle?	2M	2	L1
4	Mention the different types of condensers.	2M	2	L1
5	List various components used in Vapor absorption refrigeration system.	2M	3	L1
6	What is the function of an absorber in Vapor absorption refrigeration system?	2M	3	L1
7	Define Psychometric.	2M	4	L1
8	What is meant by Sensible heating?	2M	4	L1
9	List out the various components used in air conditioning.	2M	5	L1
10	Mention different types of air filters used in air conditioning systems.	2M	5	L1

Part-B

Answer All the following questions. (5X10M=50Marks)		Marks	CO	BTL
11	a) With the help of neat sketches, differentiate between heat engine, refrigerator and heat pump. b) With the help of T-S and P-h diagrams explain the effect of sub-cooling in vapor compression refrigeration cycle.	5M 5M	1	L2
	OR			
12	1.5 KW per tonne of refrigeration is required to maintain the temperature of -40^0C in the refrigerator. If the refrigeration cycle works on Carnot cycle determine i) COP of the cycle ii) Temperature of the sink iii) Heat rejected to the sink per tonne of refrigeration iv) Heat supplied and EPR if the cycle is used as a heat pump.	10M	1	L2
13	a) With the help of neat sketches explain the working principle of a Reciprocating compressor b) Derive an expression for the work done during isothermal compression by a reciprocating compressor	5M 5M	2	L2
	OR			
14	a) Explain the factors affecting the Condenser capacity b) With the help of neat sketches explain the working of i) Tube-in- tube condenser and ii) Shell and coil condenser.	4M 6M	2	L2

15	Explain with the help of a neat sketch working of simple vapour absorption system.	10M	3	L2
	OR			
16	In an aqua-ammonia absorption refrigeration system of 10TR capacity, the vapours leaving the generator are 100% pure NH_3 saturated at 40^0C. The evaporator, absorber, condenser and generator temperatures are: -20^0C, 30^0C, 40^0C and 70^0C respectively. At absorber exit, the concentration of ammonia in solution is x= 0.38 and enthalpy h= 22 KJ/kg. At generator exit x= 0.1 and h= 695 KJ/kg. Determine i) Mass flow rate of ammonia in the evaporator ii) Carry out overall mass conservation and mass conservation of ammonia in absorber to determine mass flow rates of weak and strong solutions iii) Heat rejection in absorber and condenser iv) Heat added in generator and v) COP	10M	3	L2
17	a) Explain the following i) Room Sensible Heat Factor (RSHF) ii) Grand Sensible Heat Factor (GSHF) b) What are the factors affecting optimum effective temperature	6M 4M	4	L2
	OR			
18	a) What do you understand by the term cooling load b) A room has a sensible heat gain of 24 KW and a latent heat gain of 5.2 KW and it has to be maintained at 26^0C DBT and 50%RH. 180m^3/min of air is delivered to the room. Determine the state of supply air.	5M 5M	4	L2
19	a) Explain the following: i) Comfort air-conditioning system ii) Industrial air-conditioning system. b) Explain with the help of neat sketches different types of axial flow fans	6M 4M	5	L2
	OR			
20	A centrifugal fan has a circular inlet duct of 0.45m diameter and a rectangular outlet duct of 0.45m by 0.375m. The static pressure at the fan inlet is −12.5 mm of water and the static pressure at the fan outlet is 25 mm of water when the fan delivers 115m^3/min and absorbs 1 KW.Assuming standard air density in both ducts and compressibility factor as 1. Determine i) Total pressure at fan inlet and outlet ii) Fan total pressure and fan static pressure and iii) Fan efficiency and fan static efficiency.	10M	5	L2