*R20 Regulation* *Subject code: 3E6CC*

# TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

## B.Tech VI Semester Supplementary Examinations, November 2025

# REFRIGERATION & AIR CONDITIONING

*(ME)*

*Maximum Marks: 70* Date: 13.11.2025 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 | What is tone of refrigeration? | 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 | Mention various components used in Vapor absorption refrigeration system. | 2M | 3 | L1 |
| 6 | What are the advantages of vapor absorption system over vapor compression refrigeration system? | 2M | 3 | L1 |
| 7 | Define relative humidity. | 2M | 4 | L1 |
| 8 | What is meant by Sensible cooling? | 2M | 4 | L1 |
| 9 | What is the function of a filter in an air conditioning system? | 2M | 5 | L1 |
| 10 | What is meant by dehumidification? | 2M | 5 | L1 |

Part-B

| Answer All the following questions. (5X10M=50Marks) | | Marks | CO | BTL |
|---|---|---|---|---|
| 11 | With the help of P-V and T-S diagrams explain the various processes in Carnot refrigeration cycle | 10M | 1 | L2 |
| | OR | | | |
| 12 | a) Explain the various components in a Vapour compression Refrigeration system<br>b) In an ammonia vapour compression system, the pressure in the evaporator is 2 bar. Ammonia at exit is 0.85 dry and at entry its dryness fraction is 0.19. During the compression, the work done per kg of ammonia is 150 KJ. Calculate the COP and the volume of vapour entering the compressor per minute, if the rate of ammonia circulation is 4.5 kg/min. The latent heat and specific volume at 2 bar are 1325 KJ/kg and 0.58 $m^3/kg$. | 5M<br>5M | 1 | L2 |
| 13 | a) With the help of P-V and T-S diagrams derive an expression for the work done by a reciprocating compressor during polytropic compression<br>b) Differentiate between the air cooled and water-cooled condensers. | 5M<br>5M | 2 | L2 |

| | | | | |
|---|---|---|---|---|
| | OR | | | |
| 14 | With the help of a neat sketch describe the working of a thermostatic expansion valve. | 10M | 2 | L2 |
| 15 | Write down the various advantages of Vapour absorption refrigeration system over Vapour compression refrigeration system | 10M | 3 | L2 |
| | OR | | | |
| 16 | The following data refer to a LiBr and $H_2O$ Absorption system:<br>Generator temperature = $80^0$C, Condenser temperature = Absorber temperature= $30^0$C<br>Evaporator temperature= $10^0$C, Condensate temperature= $25^0$C. Steam enters the generator heating coil at $120^0$C and leaves at $100^0$C as condensate. The concentration of liquid leaving the generator is 0.65 and its enthalpy is −75 KJ/kg. The concentration of liquid leaving the absorber is 0.51 and its enthalpy is −170 KJ/kg. The enthalpy of vapour Leaving the generator is 2620 KJ/kg. The flow rate through the evaporator is 0.4 kg/s.<br>Find: i) Pressure in generator, condenser, evaporator and absorber in mm of mercury head<br>ii) Tonnage iii) Heat rejection to condenser and absorber iv) COP and<br>v) Relative COP | 10M | 3 | L2 |
| 17 | What are the various factors affecting the comfort air conditioning? | 10M | 4 | L2 |
| | OR | | | |
| 18 | In a heating application, moist air enters a steam heating coil at $10^0$C, 50% RH and leaves at $30^0$C. Determine the sensible heat transfer, if mass flow rate of air is 100 kg of dry air per second. Also determine the steam mass flow rate if steam enters saturated at $100^0$C and condensate leaves at $80^0$C. | 10M | 4 | L2 |
| 19 | Explain the difference between winter air conditioning and summer air conditioning. | 10M | 5 | L2 |
| | OR | | | |
| 20 | a) Mention the various advantages and disadvantages of Steam humidifiers.<br>b) Describe a centrifugal fan with the help of a neat sketch. | 5M<br>5M | 5 | L2 |