**18MED33**

**Hall Ticket Number:**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |  |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **IV/IV B.Tech., (Regular) DEGREE EXAMINATION** | | | |
| **November 2022** | **Mechanical Engineering** | | |
| **Seventh Semester** | **Refrigeration & Air conditioning** | | |
| **Time:** Three Hours | | **Maximum: 5**0 Marks | | |
| **NOTE: Refrigerants and Psychrometric properties by M.L. Mathur and F.S. Mehta data book must be supplied in the examination hall.** | | | | |
| *Answer Question No. 1 Compulsorily.* | | | (10X1 = 10 Marks) |
| *Answer* ***ANY ONE*** *question from each Unit.* | | | (4X10=40 Marks) |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 1. | a) | List some of the important applications of refrigeration. | CO1 | L1 | 1M |
|  | b) | Show the Bell Coleman cycle on P-v and T-s diagrams. | CO1 | L1 | 1M |
|  | c) | List the main components of the Vapor Compression Refrigeration system. | CO2 | L1 | 1M |
|  | d) | List out the factors that affect the heat transfer capacity of evaporators. | CO2 | L1 | 1M |
|  | e) | What are the refrigerant and absorbents in the Li-Br H2O refrigeration system? | CO3 | L1 | 1M |
|  | f) | Outline the applications of the Vortex tube refrigeration system. | CO3 | L2 | 1M |
|  | g) | Define Room Sensible Heat Factor. | CO3 | L1 | 1M |
|  | h) | Define Apparatus Dew Point temperature. | CO4 | L1 | 1M |
|  | i) | What is the necessity of aircraft refrigeration? | CO4 | L1 | 1M |
|  | j) | List any two advantages of the Vapor Absorption Refrigeration system. | CO4 | L1 | 1M |
| **Unit -I** | | | | | |
| 2. | a) | Explain air refrigerator working on Bell – Coleman cycle with the help of line diagram, p – v diagram and T – s diagram. Deduce an expression for its COP. | CO1 | LI | 5M |
|  | b) | List out the properties of an ideal refrigerant. | CO1 | LI | 5M |
|  |  | **(OR)** |  |  |  |
| 3. | a) | Explain the working of a Simple Air Evaporative cooling system with the help of a neat sketch. | CO1 | L2 | 4M |
|  | b) | Determine the temperature of the air at the entry of the turbine and the power supplied by the turbine to the fan when. a simple operating air refrigeration system that circulates air at the rate of 7.5 kg/min. The air pressure entering the turbine is 4.4 bar and the cabin pressure is 1 bar. The air discharge temperature is -60C and turbine efficiency is 80%. | CO1 | L3 | 6M |
|  |  | **Unit -II** |  |  |  |
| 4. | a) | Discuss the relative advantages and disadvantages of the VCR system over the Air refrigeration system. | CO2 | L2 | 4M |
|  | b) | Find (i) COP of the plant (ii) Mass flow rate (iii) Power required to run the compressor in kW for a 5-ton Freon -12 refrigeration plant that has a saturated suction temperature of -50C. The condensation takes place at 320C and there is no undercooling of refrigerant liquid. Assume isentropic compression, | CO2 | L3 | 6M |
|  |  | **(OR)** |  |  |  |
| 5. | a) | Explain the standard vapour compression cycle with the help of line diagram, p – h diagram and T – s diagram. Explain the function of various components of the system. | CO2 | L1 | 5M |
|  | b) | Explain the working of the automatic expansion valve with a neat sketch. | CO2 | L2 | 5M |
|  |  | **Unit -III** | |  |  |
| 6. | a) | Explain the working of a simple ammonia – water absorption refrigeration system with a neat sketch. | CO3 | L3 | 5M |
|  | b) | Describe the merits and demerits of vapour absorption system compared to vapour compression system. | CO3 | LI | 5M |
|  |  | **(OR)**  **P.T.O**  **18MED31** | | | |
| 7. | a) | Show the T-s and h-s diagrams of a steam jet refrigeration system, define and write the expression for the following efficiencies (i) Nozzle efficiency (ii) Entrainment efficiency and (iii) Compressor efficiency. | CO3 | LI | 6M |
|  | b) | Explain the working of a Thermoelectric refrigerator with a neat sketch. | CO3 | L2 | 4M |
|  |  | **Unit -IV** |  |  |  |
| 8. | a) | Define the following terms (i) Dew point temperature (ii) Specific humidity (iii) Relative humidity (iv) Degree of saturation | CO4 | LI | 4M |
|  | b) | Estimate the following (i) Partial pressure of water vapor (ii) Specific humidity (iii) Relative humidity (iv) Dew point temperature for a sample of moist air which has a dry bulb temperature of 400C and a wet bulb temperature of 250C. | CO4 | L3 | 6M |
|  |  | **(OR)** |  |  |  |
| 9. | a) | Explain the working of the summer air conditioning system used for hot and wet weather conditions. | CO4 | L4 | 4M |
|  | b) | Determine the following:   1. The DBT and WBT of supply air 2. The DBT and WBT of mixed air before the cooling coil. 3. The apparatus dew point and bypass factor of the coil. 4. The refrigeration load on the cooling coil and the moisture removed by the coil for the following data:   Room conditions: 260C DBT, 190CWBT  Outside conditions: 350C DBT, 270C WBT  Room heat gains:  Sensible heat: 11.1 kW  Latent heat: 3.9 kW  ADP= 120C  The conditioned air supplied to the room is 25 % fresh air and 75% recirculated room air. | CO4 | L4 | 6M |

****