Reg. No.

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**End Semester Examination – Nov / Dec – 2019**

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| **Code :** | **14ME2051** | **Duration :** | **3hrs** |
| **Sub. Name :** | **REFRIGERATION AND AIR CONDITIONING** | **Max. Marks :** | **100** |

ANSWER ALL QUESTIONS (5 x 20 = 100 Marks)

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| **Q.**  **No.** | **Sub Div.** | **Questions** | **Course Outcome** | **Marks** |
| 1. | a. | In a refrigeration plant working on Bell- Coleman cycle, air is compressed to 5 bar from 1 bar. Its initial temperature is 10 °C. After compression the air is cooled upto 20 °C in a cooler before expanding back to a pressure of 1 bar. Determine the theoretical COP of the plant and the net refrigerating effect. Take Cp = 1.005 kJ/kg K and Cv = 0.718 kJ/kg K. | CO1 | 10 |
| b. | Explain in detail the Bell-Coleman refrigeration cycle with T-s and p-v diagram. | CO1 | 10 |
| **(OR)** | | | | |
| 2. | a. | 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 workdone 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 the specific volume at 2 bar are 1325 kJ/kg and 0.58 m3/kg respectively. | CO1 | 10 |
| b. | With a neat sketch explain Cascade refrigeration system. Represent the processes on T-s diagram. | CO1 | 10 |
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| 3. |  | Explain the different types of condensers used in refrigeration systems with neat sketch. | CO2 | 20 |
| **(OR)** | | | | |
| 4. | a. | Write any five properties of refrigerant used in vapor compression refrigeration system. | CO2 | 10 |
| b. | Explain water – ammonia vapour absorption refrigeration system and discuss its advantages over vapour compression system. | CO2 | 10 |
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| 5. |  | The atmospheric air at 30 °C dry bulb temperature and 75% RH enters a cooling coil at the rate of 200 m3/min. The coil dew point temperature is 14°C and the bypass factor of the coil is 0.1. Determine:  i) the temperature of the air leaving the cooling coil.  ii) the capacity of cooling coil in tons of refrigeration and in kW.  iii) the amount of water vapour removed per minute, and  iv) the sensible heat factor for the process. | CO3 | 20 |
|  |  | **(OR)** |  |  |
| 6. | a. | Write the factors governing optimum effective temperature in air conditioning systems. | CO3 | 10 |

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|  | b. | Explain the terms;  i) Grand sensible heat factor.  ii) Room sensible heat factor.  Also describe the method for constructing the Room sensible heat factor line. | CO3 | 10 |
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| 7. |  | In air conditioning system the inside and outside conditions are: dry bulb temperature 25 °C, RH 50 % and drybulb temperature 40 °C, wet bulb temperature 27 °C respectively. The room sensible heat factor is 0.8. 50% of room air is rejected to atmosphere and then equal quantity of fresh air added before air enters the air conditioning apparatus. If the fresh air is added is 100 m3/min., determine:  i) Room sensible and latent heat load  ii) sensible and latent heat load due to fresh air  iii) apparatus dew point temperature  iv) humidity ratio and dry bulb temperature of air entering  air conditioning apparatus.  Assume bypass factor zero, density of air is 1.2 kg/m3 at a total pressure of 1.01325 bar. | CO4 | 20 |
| **(OR)** | | | | |
| 8. |  | Explain in detail the summer air conditioning system for hot and dry condition. Mark the processes on Psychrometric chart. | CO5 | 20 |
|  | | **Compulsory**: |  |  |
| 9. |  | Explain:  i) Refrigeration system for food storage plants.  ii) Train air conditioning system. | CO5 | 20 |