Reg.No. \_\_\_\_\_\_\_\_\_\_\_\_

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**End Semester Examination – Nov/Dec – 2018**

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| **Code :** | **17ME3032** | **Duration :** | **3hrs** |
| **Sub. Name :** | **ADVANCED REFRIGERATION AND AIR-CONDITIONING SYSTEMS** | **Max. marks :** | **100** |

**ANSWER ALL QUESTIONS (5 x 20 = 100 Marks)**

*(Instructions: Use of approved refrigeration and air-conditioning data book, tables and charts are permitted)*

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| **Q. No.** | **Sub Div.** | **Questions** | **Course**  **Outcome** | **Marks** |
| 1. | a. | Discuss the methods employed to improve the coefficient of performance of a vapour compression cycle. | CO1 | 10 |
| b. | With a simple sketch explain the working principle of a cascade refrigeration cycle. | CO1 | 10 |
| (OR) | | | | |
| 2. |  | It is proposed to replace R-12 by ozone friendly R-134a in a refrigeration plant of 10 TR capacity with evaporator and condenser temperatures of 0ºC and 40ºC respectively. Compare the mass flow rate and coefficient of performance of the plant for the two refrigerants. | CO2 | 20 |
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| 3. |  | With a neat schematic explain the working principle of a vortex refrigeration system. List out its advantages and disadvantages. | CO1 | 20 |
| (OR) | | | | |
| 4. |  | With a neat schematic, describe how dry ice is manufactured. Mention some of its applications. | CO1 | 20 |
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| 5. |  | Find the coefficient of performance of a water-lithium bromide absorption cooling system for sink temperature = 40ºC, generator temperature = 110ºC, evaporator temperature = 10ºC, effectiveness of solution heat exchanger = 75% and mass flow rate of the strong = 60 kg/min. Check for energy balance. | CO2 | 20 |
| (OR) | | | | |
| 6. |  | Determine the coefficient of performance of aqua-ammonia absorption refrigeration system for absorber temperature = 30ºC, condenser temperature = 40ºC, generator temperature = 130ºC, evaporator temperature = -10ºC, effectiveness of solution heat exchanger = 90% and refrigeration load = 7 kW. Check for energy balance. | CO2 | 20 |
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| 7. | a. | 1 kg of air at 20ºC dry bulb temperature and 40% relative humidity is mixed adiabatically with 2 kg of air at 40ºC dry bulb temperature and 40% relative humidity. Find specific humidity and enthalpy of the final condition of air. | CO3 | 10 |
| b. | Atmospheric air is at 35ºC dry bulb temperature and 50% relative humidity. Using psychrometry chart, find wet bulb temperature, humidity ratio, dew point temperature and enthalpy of air per kg of dry air. | CO3 | 10 |
| (OR) | | | | |
| 8. |  | Using ISHRAE standards, design an air-conditioning system for an office located in Hyderabad for the following conditions.  Outdoor condition: 106ºF DBT and 78ºF WBT  Room condition: 75ºF DBT and 50% RH  Floor area: 8000 sq.ft  Width of the glass in west, south and north sides are 50’, 20’ and 80’ respectively  Width of the wall/roof on the west side is 50’  Wall height: 12’  Light load: 1.0 W/sq.ft  Width of the partition wall: 140’  Number of occupants: 40  Number of appliances: 524  By pass factor: 0.10 | CO4 | 20 |
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|  | | **Compulsory**: |  |  |
| 9. | a. | An air-conditioning system has volume flow rate of 7.5m3/s and fan outlet velocity is 10m/s. The duct has four branches with 90º elbows. The first branch is 10m from fan. The distance between branches is 10m and the main duct has 90º elbow 10m after the fourth branch. The volumetric flow rate in each branch is 1.5m/s. The main duct runs after the 90º bend. Using equal friction method, determine the equivalent diameter of the duct and the dimensions of the rectangular duct if one side of the duct is 0.5m. | CO5 | 10 |
| b. | Plot the fan performance curve and discuss about it. | CO6 | 10 |