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



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

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| **Code :** | **18FP3014** | **Duration :** | **3hrs** |
| **Sub. Name :** | **REFRIGERATION AND COLD STORAGE ENGINEERING** | **Max. marks :** | **100** |

**ANSWER ANY FIVE QUESTIONS (5 x 16 = 80 Marks)**

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| **Q. No.** | **Sub Div.** | **Questions** | **Course**  **Outcome** | **Marks** |
| 1 | a. | Ice is formed at 0°C from water at 20°C. The temperature of the brine is – 8°C. Find out the kg of ice formed per kWh. Assume that the refrigeration cycle used is perfect reversed Carnot cycle. Take latent heat of ice as 335 kJ/kg. | CO2 | 10 |
| b. | Illustrate the important properties of refrigerants and give examples for each case. | CO2 | 6 |
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| 2. | a. | Write short note on cold load estimation. | CO3 | 6 |
| b. | Calculate the reduction in the amount of heat transmitted through the wall shown in the figure due to the insulation. The area of the wall is 1 m2 and the coefficients of convective heat transfer are 10 W/m2K for external surface and 5 W/m2K for internal surface.Glasswool is taken as the insulating material. Thermal conductivity of the materials are - Plaster 1 W/mK, Brick 0.5 W/mK, Gypsum 0.8 W/mK, Glasswool 0.04 W/mK. | CO4 | 10 |
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| 3. | a. | Differentiate humidification and dehumidification process. | CO5 | 8 |
| b. | Describe transmission and distribution of air in air conditioning system in detail. | CO6 | 8 |
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| 4. | a. | Explain various commercial freezing equipments used and state its significance. | CO4 | 8 |
| b. | Explain the freezing rate affects the crystal size and its effect on the texture and quality of the frozen foods. | CO3 | 8 |
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| 5. | a. | What is evaporative cooling and direct expansion techniques in chilling process and state its importance. | CO1 | 10 |
| b. | Illustrate the important factors to be considered for the Chilled food transport. | CO2 | 6 |
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| 6. | a. | Explain Vapour absorption refrigeration system with neat sketch and obtain the relation for coefficient of performance. | CO1 | 6 |
| b. | A refrigeration machine is required to produce ice at 0°C from water at 20°C. The machine has a condenser temperature of 298 K while the evaporator temperature is 268 K. The relative efficiency of the machine is 50% and 6 kg of Freon-12 refrigerant is circulated through the system per minute. The refrigerant enters the compressor with a dryness fraction of 0.6. Specific heat of water is 4.187 kJ/kg K and the latent heat of ice is 335 kJ/kg. Calculate the amount of ice produced in 24 hours. The table of properties of Freon-12 is given below :  Temperature Liquid heat Latent heat Entropy of liquid  K kJ/kg kJ/g kJ/kg  298 59.7 138.0 0.2232  268 31.4 154.0 0.1251 | CO2 | 10 |
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| 7. | a. | A simple vapour compression plant produces 5 tonnes of refrigeration. The enthalpy values at inlet to compressor, at exit from the compressor, and at exit from the condenser are 183.19, 209.41 and 74.59 kJ/kg respectively. Estimate  (i) The refrigerant flow rate, (ii) The C.O.P.,  (iii) The power required to drive the compressor, and  (iv) The rate of heat rejection to the condenser | CO3 | 10 |
| b. | Define freezing injury and what are the optimum temperatures of storage for different food materials. | CO6 | 6 |
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| **COMPULSORY QUESTION (1 x 20 = 20 Marks)** | | | | |
| 8. | a. | Write short note on i. Traceability and barcode ii. Product Temperature and Moisture monitoring | CO3 | 10 |
| b. | Discuss about the of Refrigeration systems and Refrigerant types used during field chilling | CO5 | 10 |