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

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

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| **Code :** | **14FP2011** | **Duration :** | **3hrs** |
| **Sub. Name :** | **REFRIGERATION, AIR CONDITIONING AND COLD STORAGE** | **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. | 500 kg of fish at 30°C are kept in a bunker with 100 kg of blocks of ice at 0°C. It has taken 8 hours for the ice to melt to water at 0°C. Maintaining the same heat transfer rate, find what will be the equilibrium temperature of fish and water, and after how many hours this would occur? The specific heat of fish may be taken as 5.2 kJ/kg °C. | CO2 | 10 |
| b. | The performance test of an A/C unit rated as 40 TR seems to be poor cooling. The test on heat rejection to atmosphere in its condenser shows the following.   * Cooling water flow rate 4 L/s * Water temperatures: in 30°C out 40°C * Power input to motor: 48KW (95% efficiency) * Calculate the actual refrigeration capacity. | CO2 | 10 |
| (OR) | | | | |
| 2. | a. | Illustrate the construction and working of vapor compression cycle with a neat sketch. | CO1 | 8 |
| b. | Describe in detail about various types of condensors available in Refrigeration systems. | CO1 | 8 |
| c. | Write a note on primary and secondary refrigerants. | CO1 | 4 |
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| 3. | a. | Illustrate with a neat sketch construction and working of the following:   1. Plate freezer 2. Air Blast freezer | CO1 | 14 |
| b. | Find the properties of air with 40°C dry bulb temperature and 28.5 g water/kg dry air moisture content at 1 atm. Calculate % saturation and partial pressure of water vapor from the above properties. | CO2 | 6 |
| (OR) | | | | |
| 4. | a. | A spherical food product is being frozen in an air-blast freezer. The initial product temperature is 10°C and the cold air -40°C. The product has a 7cm diameter with density of 1000 kg/m3, the initial freezing temperature is -1.25°C, the thermal conductivity of the frozen product is 1.2 W/(m K), and the latent heat of fusion is 250 kJ/kg. Compute the freezing time using plank’s method. Convective heat-transfer coefficient h= 50 W/(m2 K). | CO2 | 12 |
| b. | Explain in detail about freezing time of food materials with suitable diagram. | CO1 | 8 |
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| 5. | a. | Describe the Good Manufacturing practice and Hygienic design considerations for chillers and food production systems. | CO3 | 10 |
| b. | Write down the role of initial microflora, acidification and type of spoilage in food. | CO3 | 10 |
| (OR) | | | | |
| 6. | a. | Explain the following in construction of cold storage:   1. Drainage 2. Walls 3. Ceilings | CO3 | 10 |
| b. | Write a note on Hazard Analysis Critical Control Point. | CO3 | 10 |
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| 7. | a. | Describe in detail about types of refrigeration used in cold transport | CO1 | 10 |
| b. | Write a note on cold storage and temperatures for storage of agricultural and horticultural commodities.. | CO3 | 5 |
| c. | Write down the factors to be considered in door management. | CO3 | 5 |
| (OR) | | | | |
| 8. |  | Describe the steps involved in design and construction of cold storage unit with diagrams wherever necessary. | CO3 | 20 |
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|  | | **Compulsory**: |  |  |
| 9. | a. | Explain in detail about cold chain management in international market. | CO3 | 10 |
| b. | Describe the temperature management and other factors to be considered in Cold chain management. | CO3 | 10 |