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



**UNIVERSITY**

(Karunya Institute of Technology & Sciences)

(Declared as Deemed-to-be University under Sec.3 of the UGC Act, 1956)

**End Semester Examination – April/May– 2017**

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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. | One ton of mango fruits at 35°C is to be cooled to 4°C in 8 hours. The radiation and other losses are estimated to be 10% of the refrigeration load. Find the tonnage of refrigeration and horsepower of the motor to be used if the efficiency of the motor is 85 percent. For want of data let us assume the specific heat of mango is equal to that of water. | CO3 | 10 |
| b. | 100 kg of ice at -5 °C is placed in a bunker to cool some vegetables. 24 hours later ice has melted into water at 10°C. What is the average rate of cooling in KJ/h and Ton of refrigeration provided by ice? | CO3 | 10 |
| (OR) | | | | |
| 2. | a. | Illustrate with a neat sketch the working of vapor absorption cycle. | CO2 | 8 |
| b. | Describe in detail about environmental issue caused by usage of refrigerant. | CO1 | 7 |
| c. | Write a note on Pressure Enthalpy diagram. | CO1 | 5 |
| 3. | a. | Explain in detail about freezing time of food materilas with suitable diagram. | CO2 | 8 |
|  | b. | Illustrate with a neat sketch the working of cryogenic freezers. | CO2 | 7 |
|  | c. | Write a note on IQF. | CO1 | 5 |
| (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). | CO3 | 12 |
|  | b. | Explain in detail about food quality in frozen storage. | CO1 | 8 |
| 5. | a. | Describe in detail about packaging of chilled foods. | CO1 | 10 |
|  | b. | Explain in detail about construction and working of Blast chiller and Hydro cooler and vacuum cooler. | CO2 | 10 |
| (OR) | | | | |
| 6. | a. | Explain in detail about control of storage conditions and temperature monitoring in chilled food storage. | CO1 | 10 |
|  | b. | Describe in detail about packaging of chilled foods. | CO2 | 10 |
| 7. | a. | Write briefly about expanded and extruded polystyrene materials in cold storage. | CO2 | 10 |
|  | b. | Explain in detail with a sketches of Doors used in cold storage. | CO2 | 10 |
| (OR) | | | | |
| 8. | a. | Describe in detail about polyurethane phenolic foam applications in cold storage systems. | CO2 | 10 |
|  | b. | Explain in detail the types of cold storage. | CO2 | 10 |
|  | | **Compulsory:** |  |  |
| 9. | a. | Describe in detail about field chilling methods and their applications. | CO3 | 10 |
|  | b. | Explain about the RFID technologies ued in cold chain. | CO3 | 10 |