

**Roll No.**

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**Total No. of Pages : 02**

**Total No. of Questions : 08**

**M.Tech. (Process and Food Engineering) (Sem.-1)**

# FOOD ENGINEERING

**Subject Code : MTPFE-511-22**

**M.Code :93260**

**Date of Examination : 21-01-23**

**Time : 3 Hrs.**

**Max. Marks : 60**

**INSTRUCTIONS TO CANDIDATES :**

1. Attempt any FIVE questions out of EIGHT questions.  
2. Each question carries TWELVE marks.

1. Discuss different engineering properties of foods with their importance in equipment and process designing.
2. Write a short note on different types and properties of fluid flow.
3. Describe simple vapour compression refrigeration system with the help of a neat flow diagram supplementing with P-h & T-s phase diagrams.
4. **Differentiate between the terms:**
  - a. Refrigeration and freezing
  - b. Steady state condition and unsteady state condition
  - c. Pasteurization and Sterilization.
5. **a. Discuss the following terms :**
  - i. D value
  - ii. Z value
  - iii. F value.
  - b. Discuss the thermal process calculation by graphical methods.
6. **a. Derive the Plank's equation for freezing time. Discuss its limitations also.**

- b. A spherical food product is frozen in the air-blast freezer. The initial temperature of the product is  $20^{\circ}\text{C}$ , and the temperature of the cold air is  $-50^{\circ}\text{C}$ . The product has a diameter of 5 cm, with a density of  $1000 \text{ kg/m}^3$ . The initial freezing temperature is  $-2.2^{\circ}\text{C}$ . The thermal conductivity of frozen product is  $1.2 \text{ W/m K}$ ; latent heat of fusion is  $250 \text{ kJ/kg}$ . And the heat transfer coefficient is  $50 \text{ W/m}^2 \text{ K}$ . Calculate the freezing time.
7. Discuss in detail the different mixers used for high viscosity pastes and dry solids.
8. **Discuss the following terms :**
- a. Kneading
  - b. Blending
  - c. Homogenization

**NOTE : Disclosure of Identity by writing Mobile No. or Marking of passing request on any paper of Answer Sheet will lead to UMC against the Student.**