

MAHARASHTRA ANIMAL AND FISHERY SCIENCES UNIVERSITY, NAGPUR
SEMEISTER END THEORY EXAMINATION, B.TECH. (D.T.) Degree Course 2017-18

Semester	: VI (New Syllabus)	Academic Year	: 2017-2018
Course No.	: DE-611	Course Title	: Food Engineering
Credits	: 3+1=4	Total Marks	: 50
Day & Date	: Wednesday, 13.06.2018	Time	: 11.00 to 13. Hrs.

- Note :**
- 1) Section "A" is Compulsory.
 - 2) Solve **Any Five** questions from Section "B"
 - 3) The use of scientific tables, charts and calculator is allowed in case of engineering courses.

SECTION - 'A'

Q.1 A) Choose the most appropriate answer from the options given below. (05)

- i) fluids exhibit a linear increase in the shear stress with the rate of shear.
 - a) Plastic
 - b) Solid
 - c) Thixotropic fluids
 - d) Newtonian fluids
- ii) Instruments used for measuring flow properties of fluids are called as
 - a) Dryers
 - b) Centrifugal separator
 - c) Viscometers
 - d) Evaporators
- iii) can be defined as the sensory manifestation of the structure of the food and the manner in which this structure reacts to applied forces, the specific senses involved being vision, kinesthetics and hearing.
 - a) Texture
 - b) Attributes
 - c) Vision
 - d) Olfactory system
- iv) The latent heat of freezing of water is.....
 - a) 225 kJkg⁻¹
 - b) 105 kJkg⁻¹
 - c) 335 kJkg⁻¹
 - d) 302 kJkg⁻¹
- v) In the water vapour is sublimed off frozen food, the food structure is better maintained under these conditions.
 - a) Vacuum drying
 - b) freeze drying
 - c) Microwave vacuum drying
 - d) Fluidized bed drying

B) Do as directed. (05)

- i) Define Latent Heat
- ii) Define Triple Point of water
- iii) If the weight of water in 1 kg food is 0.778 kg, find the moisture content in it on dry basis.
- iv) Enlist the two stages for drying of foods by Freeze drying.
- v) Define the "flash distillation"

Q.2 A) Give the formulae for the following. (05)

- i) The most commonly used equation for characterizing non-Newtonian Fluids i.e. Power Law Model.
- ii) The freezing time for the rectangular slab
- iii) Equation of Rittinger's Law for size reduction.
- iv) Equation of Bond's law.
- v) Reynolds Number

(P.T.O.)

- B) State whether True or False. If false, rewrite the statement after making necessary corrections. (05)
- Heat transfer in vacuum drying is generally by conduction, sometimes by radiation.
 - In Air blast freezers, air is recirculated over food at between -30°C and -40°C at a velocity of $1.5-6.0 \text{ m s}^{-1}$.
 - Drying is a process of heat transfer only.
 - Blanching is used in the liquid foods.
 - Plate freezers consist of a vertical or horizontal stack of hollow plates, through which refrigerant is pumped at -40°C .

SECTION – 'B'

- Q.3 Explain the classification of foods on the basis of Shear Stress Vs Shear Strain behaviour. (06)
- Q.4 A feed containing 80% water is to be dried at 100°C to a moisture content of 10%. If the initial temperature of the food is 21°C calculate the quantity of heat energy required, per unit weight of the original material, for drying under atmosphere pressure. The latent heat of vaporization of water at 100°C and at standard atmospheric pressure is 2257 kJ kg^{-1} and of specific heat of water is $4.186 \text{ kJ kg}^{-1}\text{C}^{-1}$. Also find steam requirement if saturated steam at 110°C is used as heating medium ($h_{fg} = 2230 \text{ kJ kg}^{-1}$). (06)
- Q.5 Explain the working of plate freezer with the neat sketch. (06)
- Q.6
- Explain the visco-elastic model for foods. (02)
 - It is desired to freeze 10000 loaves of bread each weighing 0.75 Kg from 18°C to -18°C in a such a way that maximum heat demand of the freezing is twice the average demand. Estimate the maximum demand if the total freezing time is to be 6 hours. (02)
 - Explain the working of cabinet dryer. (02)
- Q.7
- Enlist the various textural properties of the solid foods. (03)
 - Explain the falling rate drying period with diagram. (03)
- Q.8
- State the equation to calculate Total drying time. (02)
 - State the important advantage of freeze drying. (02)
 - State the function of the Pulper. (02)
- Q.9
- Enlist various thermal properties of frozen foods. (02)
 - Derive an equation for the freezing time determination by Plank's method. (04)
