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Total No. of Pages : 02

Total No. of Questions : 18

B.Tech. (Food Technology) (Sem.-5)
FOOD PROCESSING ENGINEERING
Subject Code : BTFT-506
M.Code : 78651

Time : 3 Hrs.

Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
2. SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.
3. SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.

SECTION-A**Write briefly :**

- 1) Differentiate between equivalent diameter and geometric mean diameter.
- 2) Which size reduction law is used to calculate energy in coarse grinding? Define the same.
- 3) Define thermal death time.
- 4) Differentiate between dead-end filtration from cross flow filtration.
- 5) What is the difference between dew point and wet bulb temperature?
- 6) Define water activity. How it differs from moisture content?
- 7) *"The freezing time predicted by Plank's equation is less than that of actual freezing time."* Comment and give reasons.
- 8) How dry steam differs from wet steam at the same pressure.
- 9) How boiling point elevation influence the evaporation process?
- 10) What is Mollier diagram? Can it be used to determine properties of wet steam?

SECTION-B

- 11) a) What is difference between sorting and grading? Write a brief on the various graders and sorters used for fruits.
b) Describe various types of mixers used for low viscosity liquid mixing. Mention their distinguished features and applications.



- 12) A tunnel dryer is used to dry potatoes from initial moisture content of 75% (w.b.) to final moisture content of 5% (w.b.). An experimental drying curve for the potatoes indicate that the critical moisture content is 30% (w.b.) and the time for constant drying is 10 min. Based on this data, estimate the total drying time for the potatoes.
- 13) Differentiate between sedimentation and centrifugation. With suitable line sketch describe the construction, working and applications of any centrifuge used in dairy industry.
- 14) Name the four common ways of breaking solids in size-reduction machines. Write in brief the construction, operation and applications of hammer mill.
- 15) Discuss the methods to improve the economy of an evaporator.

SECTION-C

- 16) a) Differentiate between Survivor curve and thermal death time curve. Derive an expression for microbial inactivation rate at constant temperature.
b) A thermal process is accomplished by instantaneous heating to 138°C followed by a 4 sec hold and instantaneous cooling. Estimate the lethality at 121°C when the thermal resistance constant (z) for the microorganism is 8.5°C.
- 17) a) Explain the crystallization process using different theories. Describe a batch crystallizer with a neat diagram.
b) A food block of size 25cm x 50cm x 75cm is to be frozen in refrigerated with the plate temperature at 239 K. How long it will take to freeze if the food is wrapped in a package of 0.1 cm thickness. What would be the freezing time without packaging? Assume that for the plate freezer surface heat transfer coefficient is 600 J/ms°C, thermal conductivity of frozen meat and packaged material is 1.6 and 0.06 J/ms°C. The latent heat of fusion of the food is 256 kJ/kg and density is 1090 kg/m³. Assume that meat freezes at 271K. Use Plank's equation and take values of shape factors $P= 0.275$ & $R= 0.078$.
- 18) a) Discuss the criteria for the selection of a suitable evaporator. Explain the factors that influence the rate of heat transfer and economy of evaporators.
b) The orange juice is being concentrated from 5 to 30% solids in a single-effect continuous evaporator. The juice at 20°C is fed to the evaporator at 5000 kg/h. Steam is available at 100°C. The saturation temperature of vapour in the evaporator is 50°C. The condensate leaves the evaporator at 75°C and the solution has a negligible boiling point elevation. The latent heat of vaporization at 50°C is 2382.7 kJ/kg. The specific heat of orange juice is 4.05 kJ/kg°C. Calculate the steam requirement and steam economy.

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