

**M. Tech Odd Semester Examination, February, 2023**

**Agricultural Engineering**

(1st Semester)

Course No.: 1AE201

**(Advance Food Process Engineering)**

*Full Marks: 70*

*Pass Marks: 28*

*Time: 3 hours*

- Note:**
1. Attempt 05 (Five) questions by taking one from each unit.
  2. Begin each answer in a new page.
  3. Answer parts of a question at a place.
  4. Assume reasonable data wherever required.
  5. The figures in the right margin indicate full marks for the question.

**UNIT-I**

1. (a) Explain the freeze-drying process with the help of a neat sketch and also mention the advantages of the freeze-drying system. 9  
(b) Calculate the equilibrium moisture content of brinjal seed at relative humidity of 10% and temperature of 50° using Henderson's equation. Given that constants c is  $6.5 \times 10^{-6}$  and n is 1.8. 5
2. Write short notes on the followings 3.5x4
  - i. Constant rate drying
  - ii. Hysteresis effect
  - iii. Thin-layer drying
  - iv. Equilibrium moisture content

**Turn Over**

## UNIT-II

3. (a) What is difference between Evaporation and dehydration? Differentiate between single effect evaporator and multiple effect evaporator. 9
- (b) An evaporator has a rated evaporation capacity of 200 kg/h of water. What will be the rate of production of concentrated juice containing 40% of total solids from a raw juice containing 10% solids? 5
4. (a) Describe the thermal death rate kinetics of micro-organism. Also explain the D-Value (Decimal reduction time). 10
- (b) The F value at 121.1°C equivalent to 99.999% inactivation of a strain of *C. botulinum* is 1.2 minute. Calculate the  $D_0$  value of this organism. 4

## UNIT-III

5. (a) What is size reduction? Explain all the three laws associated with energy estimation for size reduction. 9
- (b) The energy required to reduce the size of a food material from a mean diameter of 12 mm to 4 mm is 10 kJ/kg. form Rittingers' law, what will be the energy needed in kJ/kg to reduce the same material from a diameter of 1.2 mm to 0.4 mm. 5
6. With neat sketch diagram, explain the followings  
7×2
- i. Hammer mill
- ii. Rubber roll sheller

## UNIT-IV

7. (a) What is difference between agitation and mixing? Write purpose of agitation of liquid. 7
- (b) What is homogenization of milk? Explain the mechanism of homogenization. 7
8. Explain the followings in details 5+5+4=14
- i. Propeller
- ii. Turbine
- iii. Paddle

## UNIT-V

9. (a) What is extrusion cooking? Draw the cross section of screw and barrel of single screw extruder. Also find out the net flow of an extruder. 11
- (b) Describe the term Aseptic processing 3
10. (a) With neat sketch diagram, explain the twin screw extruder and discuss different type of flow that occurs in extruder. 9
- (b) Differentiate between batch and continuous retorts. 5

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