M.Tech Even Semester Examination, May, 2025

Agricultural Engineering

(2nd Semester)

Course No: 3AG-151

(Advanced Food Process Engineering-II)

Full Marks: 70

Pass Marks: 28

Time: 3 hours

Note:

1. Attempt any five questions 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 figure in the right margin indicates full marks for the question
6. All the mathematical symbols and abbreviations have their usual meanings.

UNIT-I

1. (a) What is psychrometric chart? Enlist all the thermodynamic properties which are represented on the psychometric chart. Also, with the help of neat sketch, graphically represent these properties. 1+3+4=8

   (b) Describe the process of moisture migration in stored grain. 6

2. (a) Discuss the role of air distribution system in grain aeration. Explain the different system of air distribution methods used in storage structure. 8

   (b) Explain the followings. 2x3=6

   i. Humidity

Turn Over

ii. Humid heat

iii. Enthalpy

UNIT-II

3. Derive the equation for the velocity profile of a Newtonian fluid in fully developed laminar flow through a straight circular pipe. Sketch the shape of the velocity profile. (10+4)

4. (a) Define hydraulic radius. Write an equation for hydraulic radius of laminar flow in packed beds. 4

   (b) Define the fanning friction factor and provide its mathematical expression. 3

   (c) Particles having a size of 0.5 mm, a sphericity of 0.894, and solid density of 1200 kg/m3 are to be fluidized using air at 303 K and 2 atm pressure. The porosity of the bed at minimum fluidizing condition is 0.43. The bed diameter is 0.6 m and the bed contains 350 kg solids, the viscosity of air is 1.85 x 10-5 Pa.s. Calculate

   (a) the minimum fluidization height,

   (b) the pressure drop at minimum fluidization. 7

UNIT-III

5. With neat sketch diagram explain the followings:

   a. Plate and frame filter

   b. Rotary filter.

   c. Centrifugal filter 5+5+4=14

6. (a) Explain filtration process in detail. Also explain brief about the specific cake resistance. 7

   (b) What is fluidization? Elaborate an equation for pressure drop for flow in fluidized Beds. 7

UNIT-IV

7. Write notes on the followings

   a. Ohmic heating

   b. Infrared Processing

   c. Enthalpy

   d. Humid volume 3.5×4=14

8. Explain the working principle of microwave drying. Describe different components, advantages and limitations of microwave. 14

UNIT-V

9. What is triple point of water? Explain the freeze-drying process with the help of neat sketch and also mention the advantages and disadvantage of freeze-drying system. 14

10 Write notes on the followings

   a. Void fraction or porosity

   b. Stokes law

   c. Ergun equation

   d. Hagen – Poiseuille equation 3.5×4=14

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