Total No. of printed pages = 5

END SEMESTER EXAMINATION – 2020

Semester : 4th

Subject Code : FPT-401

ELEMENTS OF FOOD ENGINEERING-II

Full Marks – 70

Time – Three hours

The figures in the margin indcate full marks for the questions.

Instructions :

1. *All* questions of PART–A are compulsory.
2. Answer any *five* questions from PART–B.

PART – A

Marks – 25

1. Fill in the blanks : 1×5=5

   (i) Weight density of water is, ρ_{water} = ——— $\frac{N}{m^3}$.

   (ii) The study of fluids at rest is called _____.

[Turn over

(iii) A fluid, which possesses viscosity, is known as _____.

(iv) Discharge, Q = ——— × ———.

(v) In case of circular pipe if Reynold's number $R_e < 2000$, the flow is said to be _____.

2. Write true or false : 1×5=5

(i) One stoke = $10^{-4} \frac{m^2}{s}$.

(ii) Specific volume = $\frac{\text{Volume of fluid}}{\text{Weight of fluid}}$.

(iii) Tubulent flow is that type of flow in which the fluid particles move along well-defined paths.

(iv) The mass of water vapour present in 1 kg of dry air is called Humidity.

(v) Reciprocating pumps are mostly used for domestic purposes.

3. Answer the following questions : 1×15=15

(i) Define Fluid Mechanics.

(ii) What is dry air ?

(iii) Define Laminar flow.

(iv) State Bernoulli's equation.

(v) What is Specific gravity ?

(vi) Write down the Euler's equation.

(vii) Write the mathematical expression of Newton's law of Viscosity.

(viii) Why food preservation is needed ?

(ix) What is Psychrometry ?

(x) Compare Steady and Unsteady flow.

(xi) What is dry bulb temperature ?

(xii) Define Discharge.

(xiii) Write down the Cezy's equation for loss head due to friction in pipes.

(xiv) Define SFEE.

(xv) What is the SI unit of density ?

PART – B

Marks – 45

1. (a) State Continuity Equation and derive the mathematical expression. 6

   (b) Establish a relationship between SI unit and CGS units of viscosity. 3

2. (a) Define mass transfer coefficient. 4

   (b) Explain Fick's law of diffusion. 5

3. (a) State the various methods of food preservation. 4

   (b) Explain the application of refrigeration for food preservation. 5

4. (a) A 30 cm diameter pipe, conveying water, branches into two pipes of diameters 20 cm and 25 cm respectively. If the average velocity in the 30 cm diameter pipe is 3 m/s, find the discharge in this pipe. Also determine the velocity in 25 cm pipe if the average velocity in the 20 cm diameter pipe is 2.5 m/s. 6

(b) Calculate the specific weight, density and specific gravity of one litre of a liquid which weighs 8N. (Density of water 1000 kg/m^3, 1L = 10^{-3} m^3). 3

5. (a) A flat plate of area 1.5×10^6 mm^2 is pulled with a speed of 0.5 m/s relative to another plate located at a distance of 0.2 mm from it. Find the force and power required to maintain this speed, if the fluid separating them is having viscosity as 1 poise. 6

(b) Water is flowing through a pipe of 7 cm diameter under a pressure of 30 N/cm^2 (gauge) and with mean velocity of 2 m/s. Find the total head or total energy per unit weight of the water at a cross-section, which is 7m above the datum line. 3

6. Write short notes on : 3×3=9

(a) Reynolds number

(b) Newtonian and Non-Newtonian fluids

(c) Difference between Centrifugal and Reciprocating pump.