Total No. of printed pages = 4

FPT-401/EOFE-II/4th Sem/2016/N

ELEMENTS OF FOOD ENGINEERING – II

Full Marks – 70

Pass Marks – 28

Time – Three hours

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

Answer any *five* questions.

1. (a) What is fluid ? 2+3+(3×3)=14

   (b) Define rate of flow (discharge).

   (c) Differentiate between :

   (i) Compressible and Incompressible fluids

   (ii) Real and Ideal fluids

   (iii) Specific weight and Specific volume.

2. (a) What is viscosity ? Explain.

   (b) Discuss how viscosity varies with temperature.

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(c) A plate, 0.25 mm distant from a fixed plate, moves at 60 cm/s and requires a force of 2N per unit area i.e. 2 N/m^2 to maintain this speed. Determine the fluid viscosity between the plates. 3+5+6=14

3. (a) What are the assumptions that are made during the analysis of Steady Flow Energy Equation (SFEE).

(b) Derive the SFEE.

(c) The diameter of a pipe at the section 1 and 2 are 20 and 25 cm respectively. Find the discharge through the pipe if the velocity of water flowing through the pipe at section 1 is 5 m/s. Determine also the velocity at section. 4+5+5=14

4. (a) Explain the Reynold's experiment.

(b) What are the different types of losses of energy in pipes ?

(c) A main pipe divides into two parallel pipes which again forms one pipe. The length and diameter for the first parallel pipe are 2000m and 1m respectively, while the length and diameter of second pipe are 2000m and 0.8m. Find the rate of flow in each parallel pipe, of total flow in the main is 5 m^3/s. The coefficient of friction for each parallel pipe is same and equal to 0.005. 5+4+5=14

5. (a) Derive the equation $\frac{\partial p}{\partial x} = \frac{\partial \tau}{\partial y}$ for laminar flow between two parallel stationary plates.

(b) State Bernoulli's equation and mention some of its application.

(c) Calculate :

(i) the pressure gradient along flow

(ii) the average velocity

(iii) the discharge for an oil of viscosity 0.02 Ns/m^2 flowing between two stationary parallel plates 1m wide maintained 11 mm apart. The velocity midway between the plates is 2 m/s. 5+4+5 =14

6. (a) Define : 2×3+3+5=14

(i) Saturated air

(ii) Humidity

(iii) Relative humidity.

(b) State various methods of food preservation.

(c) Explain the applications of refrigeration for food preservation.

7. (a) Write short notes on any *two* : $2\times4+2\times3=14$

(i) Newton's law of viscosity

(ii) Continuity equation

(iii) Relation between SI unit of viscosity and Poise

(iv) Fick's law of diffusion.

(b) Differentiate between any *two* :

(i) Reciprocating pump and Centrifugal pump

(ii) Dry bulb temperature and Wet bulb temperature

(iii) SI unit of viscosity and Poise.