B.Tech. Fourth Semester (Polymer (Plastic) Technology) (CGS)

11108 : Momentum Transfer Operations : 4 PP 05

P. Pages : 2 **AU - 2629**

Time : Three Hours Max. Marks : 80

Notes :
1. All question carry marks as indicated.
2. Answer **three** question from Section A and **three** question from Section B.
3. Due credit will be given to neatness and adequate dimensions.
4. Assume suitable data wherever necessary.
5. Diagrams and chemical equations should be given wherever necessary.
6. Illustrate your answer necessary with the help of neat sketches.
7. Discuss the reaction, mechanism wherever necessary.
8. Use of cellphone is not allowed in exam.
9. Use of pen Blue/Black ink/refill only for writing the answer book.

SECTION – A

1. a) Define fluids. Explain shearing characteristics of fluids in detail? **6**

b) Derive an expression for the velocity distribution for laminar flow through circular pipe. **8**

OR

2. a) Water is flowing through a pipe of inside diameter 50mm. The volumetric flow rate is $0.0006m^3/sec$. Calculate the mass flow rate and mass velocity of water. Density of water is $990kg/m^3$. **7**

b) Define pressure. Obtain an expression for the pressure intensity at a point in a fluid. **7**

3. State Bernoulli's theorem. Mention the assumptions made. Derive the Bernoulli's equation. How it is modified while applying in practice? **13**

OR

4. a) Find the loss of head when a pipe of diameter 200mm is suddenly enlarged to a diameter of 400mm. The rate of flow of water through the pipe is 250 lit/s. **6**

b) Derive an expression for loss of head due to friction in pipe. **7**

5. a) Derive an expression for the flow rate of a fluid through rectangle notch. **6**

b) An orifice meter with orifice diameter 10cm is inserted in a pipe of 20cm. diameter. The pressure gauge fitted upstream and downstream of orifice meter gives readings of 19.62 N/cm^2 and 9.81 N/cm^2 respectively. Coefficient of discharge for the orifice meter is given as 0.6. Find the discharge of water through pipe. **7**

OR

6. Explain with neat sketch the construction and working of venturimeter. Prove that the discharge through a venturimeter is given by the relation **13**

$$a = cd \times \frac{a_1 a_2}{\sqrt{a_1^2 - a_2^2}} \times \sqrt{2gh}$$

Where : a_1 – area of pipe in which venturimeter is fitted.

a_2 – area of throat of venturimeter.

SECTION – B

7. a) Describe the working of reciprocating pump and obtain an expression for the work done by pump. **8**

   b) Draw and discuss the operating characteristics of a centrifugal pump. **6**

OR

8. a) Explain the operating characteristics curves of centrifugal pump. **6**

   b) Explain in detail :- **8**
   i) Cavitation. ii) Net positive suction head.

9. a) Derive the relationship between specific surface area of packed column and specific surface area of particles. **7**

   b) Discuss the various expressions used to obtain the pressure drop across the packed bed. **6**

OR

10. a) What do you understand by : **6**
    i) Total drag on a body. ii) Coefficient of drag.
    iii) Resultant force on a body.

    b) A fluid passes vertically upwards through a bed of catalyst consisting approximately spherical particles of diameter 0.3mm and density 2600 kg/m^3. The density of fluid is 900 kg/m^3 and viscosity of fluid is 9 MN s/m^2. The fractional voidage of fluidized bed at a minimum fluidisation is 0.50 and length of fluidised bed is 1.8m. **7**
    Determine :
    i) Minimum fluidisation velocity. ii) Entrainment velocity.
    iii) Pressure drop across fluidised column.

11. a) Differentiate between a hydraulic ram and centrifugal pump obtain an expression for the efficiencies of the hydraulic Ram. **8**

    b) A hydraulic lift is required to lift a load of 8kN through a height of 10 meters once in every 80 seconds. The speed of the lift is 0.5m per second. Determine: **5**
    i) Power required to drive the lift. ii) Working period of lift in seconds.

OR

12. a) How hydraulic piping, tubing and sealing is done? **7**

    b) Draw a neat sketch and explain the principle of working of hydraulic press. **6**

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