11108 : Momentum Transfer Operations : 4 PP 05

P. Pages : 2

Time : Three Hours

0667

AW - 3072

Max. Marks : 80

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Notes :
1. Answer **Three** questions from section A and **Three** questions from section B.
2. Assume suitable data wherever necessary.
3. Due credit will be given to neatness and adequate dimensions.
4. Illustrate your answer wherever necessary with the help of neat sketches.
5. Use of cell phone is strictly prohibited in examination hall.
6. Use only Blue or Black, refill or ink for writing the answer book.

SECTION - A

1. a) Explain the concept of fluids and non-fluids. Give the classification of fluids. **7**

   b) Derive the expression for velocity profile of laminar flow of Newtonian fluid through cylindrical tube. **6**

OR

2. a) Define Pascal law. Explain the principle and applications of inclined manometer and Inverted U-tube manometer. **7**

   b) Differentiate between:- **6**
   i) Laminar flow and Turbulent flow
   ii) Steady flow and Unsteady flow.
   iii) Compressible flow and Incompressible flow.

3. a) Explain the following: **9**
   i) Heads associated with flowing fluid.
   ii) Friction factor and equivalent length of pipe.
   iii) Head loss due to sudden expansion.

   b) The rate of flow of water through horizontal pipe is 0.25 m³/sec. The diameter of the pipe is 20 cm. What is the velocity of water? If the diameter of the pipe is increased to 40 cm, what will be the velocity? **4**

OR

4. a) For an incompressible fluid with three dimensional steady flow, show that: **7**
   $\partial u / \partial x + \partial v / \partial y + \partial w / \partial z = 0$.

   b) An oil of specific gravity 0.9 and viscosity 0.06 poise is flowing through a pipe of 20 cm diameter at the rate of 60 lit/sec. Find head lost due to friction for a 500 m length of pipe. Find the horse power required to maintain this flow. **6**

5. a) Suggest the suitable flow meter to measure average flow rate of incompressible fluid through the pipe. The flow meter should be of lower cost even though losses may be higher. Describe its construction and working principle. **8**

   b) Carbon tetrachloride of specific gravity 1.6 flows through a pipe. The differential gauge attached to the pitot static tube shows a 76 mm deflection of mercury. Find velocity. Assume coefficient of discharge for tube as 1.0. **6**

OR

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6. a) Suggest the suitable flow meter to measure the point velocity in closed flow to determine the velocity profile. Discuss its construction and working principle. **6**

b) Sulphuric acid of specific gravity 1.3 is flowing through a pipe of of 50 mm. I.D. A thin lipped orifice, 10 mm in diameter is fitted in the pipe and differential pressure shown by mercury manometer is 10 cm. Calculate weight of the acid flowing per second. Take coefficient of discharge for meter as 0.6. **8**

SECTION - B

7. a) Suggest the suitable pump and describe its construction and working for pumping of hydraulic oil in the hydraulic circuit of injection molding machine (higher pressure requirement). **7**

b) Discuss the characteristics of centrifugal pump. **6**

OR

8. a) Discuss the following:
   i) Cavitation,   ii)   NPSH. **6**

b) A single acting reciprocating pump running at 40 rpm is discharging 1.0 m³/min of water. The pump has a stroke of 40 cm. The diameter of the piston is 20 cm. The delivery and suction heads are 20 m and 5 m respectively. Find slip of pump and horse power required to drive the pump. **7**

9. a) Derive the equation to find out the terminal settling velocity in Stoke's law region. **6**

b) What are the types of fluidization? State the applications of packed bed and fluidized bed. **8**

OR

10. a) Sketch the curve for pressure drop across packed bed verses gas velocity. Show loading and flooding points. At what velocity would you operate the packed bed? **5**

b) Explain the following terms:
   i) Drag coefficient,   ii)   Terminal settling velocity,
   iii) Minimum fluidization velocity. **9**

11. a) Draw the sectional view and explain the working of solenoid valve. **7**

b) Draw the diagram of differential accumulator and explain its working. **6**

OR

12. a) Draw the symbols used for following valves in hydraulic circuit:
   i) 3 position, 4 way direction control valve open at centre.
   ii) 3 position, 4 way direction control valve closed at centre
   iii) 3 position, 4 way direction control valve tandem at centre. **6**

b) Draw and explain Meter-out type of circuit used in plastics processing machines. **7**

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