

**B.TECH SEM - IV (2007 COURSE) (CHEMICAL ENGG.) :**

**SUMMER - 2018**

**SUBJECT : FLUID MECHANICS**

Day : **Thursday**  
Date : **07/06/2018**

Time : **10.00 AM TO 01.00 PM**  
Max. Marks : 80

**S-2018-2602**

**N.B.**

- 1) Q.1 and Q.5 are **COMPULSORY**. Out of the remaining attempt any **TWO** questions from each Section.
- 2) Figures to the right indicate **FULL** marks.
- 3) Answers to both the sections should be written in **SEPARATE** answer book.
- 4) Use of non-programmable calculator is allowed.
- 5) Assume suitable data if necessary.

**SECTION - I**

- Q.1**
- a) What is dimensional homogeneity? Explain with an example. (04)
  - b) Explain in detail laminar and turbulent flow in boundary layers. (04)
  - c) Explain the following terms: (06)
    - i) Steady and Unsteady flow
    - ii) Uniform and Non-uniform flow
    - iii) Laminar and Turbulent flow
- Q.2**
- a) Explain the various types of simple manometers with neat labeled diagram. (07)
  - b) Define the following fluid properties and write their SI unit and dimensions: (06)
    - i) Kinematic viscosity
    - ii) Specific weight
- Q.3**
- a) State Bernoulli's equation. Write assumptions, limitations and applications of Bernoulli's equation. (07)
  - b) A pipe of diameter 400 mm carries water at a velocity of 25 m/s. The pressures at the points A and B are given as 29.43 N/cm<sup>2</sup> and 22.563 N/cm<sup>2</sup> respectively while the datum head at A and B are 28 m and 30 m. Find the loss of head between A and B. (06)
- Q.4**
- a) Derive an expression for the velocity distribution in for fully developed laminar flow in circular pipe using formula  $\tau = -\left(\frac{\partial P}{\partial x}\right)\frac{r}{2}$ . Also sketch the velocity distribution and shear stress distribution across the section of pipe. (07)
  - b) What power is required per kilometer of a pipe line to overcome the viscous resistance to the flow of glycerine through a horizontal pipe of diameter 100 mm at a rate of 10 lit/sec ? Take viscosity ( $\mu$ ) = 8 poise and kinematic viscosity = 6 stokes. (06)

**SECTION - II**

- Q.5**
- a) Derive expression for discharge over rectangular notch. (04)
  - b) Write applications of fluidization. (04)
  - c) Explain Pitot tube with neat labeled diagram. (06)
- Q.6**
- a) Explain concept of fluidization with a graph of pressure drop and bed height v/s superficial velocity for a bed of solids. (07)
  - b) Explain various types of packings used in packed bed reactor. (06)
- Q.7**
- a) Explain orificemeter with neat labeled diagram. Also write the various cases to calculate value of difference of pressure head (h). (07)
  - b) Explain Cavitation and NPSH of centrifugal pump. (06)
- Q.8**
- a) Derive equation for loss of head due to sudden contraction of pipe for fluid flowing through a pipe. (07)
  - b) Write advantages of triangular notch over rectangular notch. (06)

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