22232

3 Hours / 70 Marks   Seat No.

Instructions : (1) All Questions are *compulsory.*

(2) Answer each next main Question on a new page.

(3) Illustrate your answers with neat sketches wherever necessary.

(4) Figures to the right indicate full marks.

(5) Assume suitable data, if necessary.

(6) Use of Non-programmable Electronic Pocket Calculator is permissible.

(7) Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.

Marks

1. **Attempt any FIVE of the following :**   **10**

(a) Give the relation between mass flow rate and volumetric flow rate.

(b) Draw a well labelled sketch of rotameter.

(c) Name any four types of valve used in the Chemical industry.

(d) Define Kinematic viscosity with its unit.

(e) State the principle of venturimeter.

(f) Water is flowing through a pipe at a rate of 20000 kg/hr. Find the flow rate of water in lit/sec.

(g) Define equivalent length of pipe fitting.

2. **Attempt any THREE of the following :** 12

   (a) Draw a sketch of diaphragm valve and give its applications.

   (b) Water of density 1000 kg/m^3 and viscosity 0.0008 N.s/m^2 is pumped at a rate of 1000 $\dfrac{cm^3}{sec}$ through a 25 mm i.d. pipe. Calculate the Reynolds number.

   (c) Describe working of centrifugal pump with a neat diagram.

   (d) Differentiate between orificemeter and venturimeter (Any four points).

3. **Attempt any THREE of the following :** 12

   (a) Explain working of reciprocating compressor with neat diagram.

   (b) Give the use of the following fittings.

      (i) Nipple   (ii) Elbow

      (iii) Plug   (iv) Reducer

   (c) Explain working of redwood viscometer with neat diagram.

   (d) Derive the equation of continuity.

4. **Attempt any THREE of the following :** 12

   (a) Define cavitation and net positive suction head.

   (b) Give any four applications of steam jet ejector.

   (c) Define fanning friction factor. Give the relation between fanning friction factor and Reynolds number for Laminar flow and turbulent flow.

   (d) A venturimeter is installed in a pipeline for the measurement of flow rate of water. The pressure drop across the throat and upstream of the meter is ten centimeters of Mercury. Calculate the volumetric flow rate of water in m^3/sec.

      Data : Diameter of throat = 15 mm

          Diameter of Pipe = 25 mm

          Co-efficient of meter = 0.98

          Density of water = 1000 kg/m^3

          Density of mercury = 13600 kg/m^3

   (e) Convert a pressure of 800 mm Hg to the following units :

      (i) kPa   (ii) atm

      (iii) psi   (iv) bar

5. **Attempt any TWO of the following :** **12**

    (a)   Give the detailed classification of pumps.

    (b)   Explain the concept of fluidisation. Also give any four industrial application of fluidisation.

    (c)   Derive the flow equation for an orificemeter.

6. **Attempt any TWO of the following :** **12**

    (a)   Differentiate between centrifugal pump and reciprocating pump. (any six points)

    (b)   Define the following :

        (i)   Ideal fluid   (ii)   Real fluid

        (iii)   Compressible fluid   (iv)   Non-compressible fluid

        (v)   Newtonian fluid   (vi)   Non-newtonian fluid

    (c)   Derive Bernoulli's equation for incompressible fluid without fluid friction.

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