21819

3 Hours / 70 Marks   Seat No. ☐☐☐☐☐☐☐☐

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

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

(3)   Figures to the right indicate full marks.

(4)   Assume suitable data, if necessary.

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

Marks

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

(a)   Define the term average velocity.

(b)   Define critical velocity of fluid.

(c)   List out different flow meters used in the chemical industry. (any four)

(d)   Define schedule number. What does it indicate ?

(e)   Define minimum fluidisation velocity.

(f)   Give the application of gear pump.

(g)   Name any one compressiable fluid, and incompressiable fluid.

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

(a)   Derive Newton's law of viscosity.

(b)   Differentiate between orificemeter and venturimeter (any four).

(c)   Draw a neat sketch of diaphragm valve.

(d)   Draw and explain characteristics curves of a centrifugal pump.

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

   (a) State and derive equation of continuity.

   (b) Derive Bernoulli's equation for incompressiable fluid without friction.

   (c) Suggest the name of fittings used for

      (i) Changing the size of pipeline.

      (ii) Branching of the pipeline.

      (iii) Termination of pipeline.

      (iv) Changing the direction of pipeline

   (d) Compare reciprocating compressor and centrifugal compressor on basis of following points :

      (i) Speed

      (ii) Rate of flow

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

   (a) An U tube mercury manometer is used to measure the pressure of water flowing in a pipeline. The mercury level in the open arm is 60 mm higher than the level of mercury in the arm connected to the pipeline. If the level of water in the arm connected to the pipeline is 50 mm, find the pressure in the pipeline in N/m^2.

      Data : Density of water = 1000 kg/m^3

      Density of mercury = 13600 kg/m^3

   (b) A 75 mm diameter pipe discharges liquid at the rate of 30 lit/sec. Determine the type of flow, if the Kinematic viscosity of the liquid is 1.2×10^{-4} m^2/sec.

   (c) Explain briefly the procedure for calibrating a given rotameter.

   (d) Distinguish between compressor and fan on the basis of speed, pressure developed, flow rate and efficiency.

   (e) Draw a neat sketch of centrifugal pump and list its parts.

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

   (a)   Acetic acid is to be pumped at a rate of 0.02 m^3/sec through a 75 mm internal diameter pipe line. What is the pressure drop in the pipe-line over a length of 70 m ?

        Data : Density of acetic acid = 1060 kg/m^3

                Viscosity of acetic acid = 0.0025 kg/m. sec

   (b)   Water is flowing through a taper pipe of diameter 100 cm at A and 50 cm at B. The rate of discharge of water is 0.08 m^3/sec. The difference in potential head is 3 m. Determine the pressure at B. The pressure at A is 3 kgF/cm^2. Neglect the frictional losses. A is on dautum level. Density of water = 1000 kg/m^3.

   (c)   Describe with a neat sketch working of single acting reciprocating pump.

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

   (a)   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 10 cm of mercury. Calculate the volumetric flow rate of water in m^3/sec.

        Data : Diameter of throat = 15 mm

              Diameter of pipe = 25 mm

              Coefficient of meter = 0.98

              Density of water = 1000 kg/m^3

              Density of mercury = 13600 kg/m^3

   (b)   Water is to be pumped at a rate of 8 m^3/hr from a large reservoir resting on the floor to the open top of an experimental absorption tower through a 50 mm internal diameter pipe. The point of discharge is 5 m above the floor and frictional losses in the entire flow system amount to 2.5 J/kg. At what height in the reservoir the water be kept if the pump can develop a power of 94 W ?

   (c)   Draw a neat diagram and explain working of steam jet ejector.

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