11920

3 Hours / 100 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. **(A) Attempt any SIX of the following :**   **12**

    (a) Define vacuum. Give the value of atmospheric pressure in mm of Hg.

    (b) Define ideal fluid and actual fluid.

    (c) Give the significance of Reynolds number.

    (d) Define Fanning's friction factor.

    (e) Define equivalent length of pipe fittings.

    (f) Give the application of gear pump.

    (g) Give the range of pressures developed by fan, blower and compressor.

    (B) **Attempt any TWO of the following :**   **8**

        (a)   Write any one formula to calculate volumetric flow rate and mass flow rate. Explain the terms involved in it.

        (b)   Draw the diagram of a gate valve and mark the parts.

        (c)   Explain priming of centrifugal pump.

2.   **Attempt any FOUR of the following :**   **16**

    (a)   Estimate the pressure exerted by a column of liquid of height 10 cm.

        (i)   When the fluid is water

        (ii)   When the fluid is a liquid of specific gravity 0.9.

    (b)   Define skin friction and form friction.

    (c)   Explain the working of rupture disc with diagram.

    (d)   Draw the diagram of a centrifugal pump and mark the parts.

    (e)   Give the formula for calculating friction factor in laminar and turbulent flow.

    (f)   Differentiate between orificemeter and venturimeter based on the following points :

        (i)   Pressure loss

        (ii)   Pressure recovery

        (iii)   Value of coefficient of discharge

        (iv)   Power consumption

3.   **Attempt any FOUR of the following :**   **16**

    (a)   Derive the equation $P = \rho gh$.

    (b)   Compare globe valve and gate valve based on the following points :

        (i)   Pressure drop

        (ii)   Application

(c) Give the classification of pumps.

(d) Explain the working of reciprocating compressor.

(e) Define Non-Newtonian fluid. List the types of Non-Newtonian fluid with example of each type.

(f) Draw the characteristics curve of centrifugal pump.

4. Attempt any FOUR of the following : 16

(a) What is schedule number of pipe ? When the pipe is said to be hydraulically smooth ?

(b) Show that N_{Re} is dimensionless.

(c) Explain the working of centrifugal blower.

(d) Explain the calibration of rotameter.

(e) Give the formula to calculate frictional loss due to sudden contraction. Explain the terms involved.

(f) Draw the diagram of Inclined Tube manometer and write equation to calculate pressure drop.

5. Attempt any TWO of the following : 16

(a) Fluid of specific gravity 1.5 and viscosity 2 Cp is flowing through a 70 mm diameter pipe at the rate of 90 m^3/hr. Length of the pipe is 150 m. Estimate the pressure drop in the pipe.

(b) Oil of specific gravity 0.8 is flowing through a 50 mm diameter pipe at the rate of 5000 cm^3/s. Calculate

    (i) Average velocity V in m/s

    (ii) Volumetric flow rate Q in m^3/hr

    (iii) Mass flow rate m in kg/s

    (iv) Mass velocity G in kg/m^2s

(c) Orificemeter is used for the measurement of flow rate of water. The pressure drop across the orificemeter is 250 mm of Hg. Calculate the volumetric flow rate in m^3/s.

Data :

Diameter of pipe = 30 mm

Diameter of orifice = 10 mm

Coefficient of discharge = 0.63

Density of Hg – 13600 kg/m^3

6. **Attempt any TWO of the following :** 16

(a) Explain the working of single acting reciprocating pump with a neat diagram.

(b) State and derive Bernoulli's equation. List the assumptions made.

(c) With a neat sketch, explain the construction, working and application (any one) of steam jet ejector.

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