21415

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.

(8) Use of steam tables, logarithmic, Mollier's chart is permitted.

Marks

1. **(A)** **Attempt any SIX :** **12**

(a) Define density and weight density.

(b) Give classification of fluid on the basis of density and viscosity.

(c) Define critical velocity in Reynold's number.

(d) Calculate the friction factor with Reynold's No. 10000.

(e) State different types of pipe fittings (any four).

(f) Give merits of positive displacement pump. (Four points).

(g) List the application of steam jet ejector.

(B) **Attempt any two :** **8**

(a) Derive Equation of continuity.

(b) Draw a neat sketch of diaphragm and butterfly valve.

(c) Explain briefly the characteristic curves of centrifugal pump with diagram.

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2. **Attempt any FOUR :** 16

   (a) Draw the diagram of U tube manometer & write the expression to calculate pressure difference.

   (b) Distinguish between form friction and skin friction.

   (c) Draw diagram of rupture disc.

   (d) What is priming and air binding in centrifugal pump ?

   (e) Write relationship between friction factor and Reynold No. for laminar & turbulent flow.

   (f) Draw a neat diagram of venturimeter and write its principle.

3. **Attempt any FOUR :** 16

   (a) Pressure at a point is 60 cm of Hg. How much will be the pressure in terms of water column ?

   (b) Write various types of valves used in Industry.

   (c) Give classification of pumps with examples.

   (d) Distinguish between Compressor, Blower and Fan on the basis of speed, pressure developed, flow rate and efficiency.

   (e) State Newton's law of viscosity. Give Mathematical expression.

   (f) Explain NPSH for a system with suction lift.

4. **Attempt any FOUR :** 16

   (a) Draw sketches of four different kinds of pipe fitting, give their specific uses.

   (b) What do you understand by Reynold's number ? What useful information does it give ?

   (c) Draw neat sketch of reciprocating compressor and write its construction.

   (d) How will you calibrate a given rotameter in laboratory ?

   (e) A fluid is flowing through 5 cm diameter pipe at a velocity of 2m/sec. Suddenly it enters into a larger cross-sectional part of the pipe having diameter of 10 cm. Calculate frictional loss due to sudden expansion of flow area.

   (f) An open reservoir contains a liquid having a density of 1250 kg./m^3. At a certain point the gauge pressure is 32.424 kN/m^2. What height above the given point is the liquid level ?

5. **Attempt any TWO :** 16

   (a) Water is flowing at a flow rate of $5 m^3$/hr in a Pipe line of 78 mm I.d. The viscosity of water is 8.0×10^{-4} Pa.s. Calculate the pressure drop and frictional loss over a length of 50 meters of pipeline.

   (b) A 30 cm diameter pipe, conveying water branches into two pipes of diameter 20 cm and 15cm respectively. If the average velocity in 30 cm diameter pipe is 2.5 m/sec. Find the discharge in this pipe. Also determine the velocity in 15 cm diameter pipe if average velocity in 20 cm diameter pipe is 2m/sec (see fig.1).
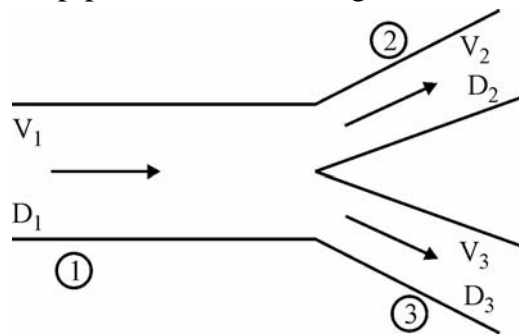
Fig. 1

   (c) An orifice meter is used to measure the flow rate of water flowing in a pipeline of 78 mm ID. The orifice diameter is 15 mm. Mercury Manometer reads 18 cm. The volumetric flow rate in this case is 719 cm^3/sec. Calculate the value of coefficient of discharge.

6. **Attempt any TWO :** 16

   (a) With neat sketch write construction and working of Gear Pump.

   (b) A 300 mm pipe carries water at a velocity of 24 m/sec. At point A and B measurement of pressure and elevation were 361 kN/m^2 and 288 kN/m^2 and 30 m and 33.5 m respectively. For steady flow find loss of head between A and B.

   (c) Explain construction and working of centrifugal blower.

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