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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**

(i) State the unit of dynamic viscosity and surface tension.

(ii) Define specific volume and weight density.

(iii) Define compressibility and bulk modulus.

(iv) Draw a neat, labelled sketch of inverted U-tube differential manometer.

(v) List the applications of Bernoulli's theorem.

(vi) Draw ideal indicator diagram for reciprocating pump.

(vii) Define Newtonion and non Newtonion fluid.

(viii) What is impact of jet?

Marks

b) **Attempt any <u>TWO</u> of the following:**   **8**

    (i)   Determine the pressure of water at point 'A' in meters of water as shown in Figure No. 1.
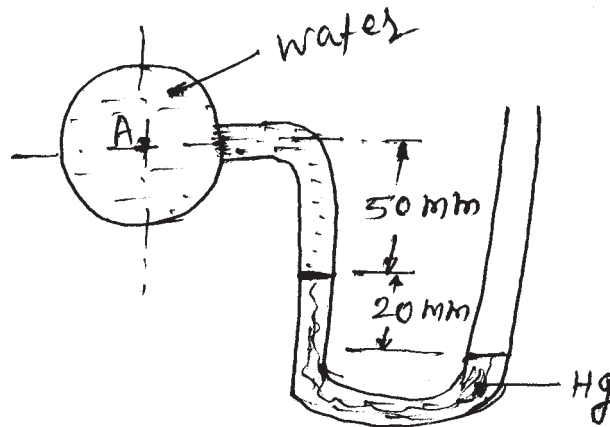

Fig. No. 1

    (ii)   Determine the height of an oil column of specific gravity 0.8 in

        1)   meter of Hg

        2)   in meter of oil column

        Which will cause a pressure of 25 kPa.

    (iii)   Write the equation for total pressure and depth of centre of pressure for immersed surface in liquid. Also state the meaning of each term.

2.   **Attempt any <u>FOUR</u> of the following:**   **16**

    a)   Draw sketch and write equations for the following:
        (i)   loss of head due to sudden enlargement and
        (ii)   loss of head due to sudden contraction.

    b)   Draw a neat, labelled sketch of pitot tube and state its function.

    c)   A pipe contains an oil of specific gravity 0.8. A differential manometer connected at the two points, at inlet and throat of the pipe shows a difference in mercury level as 200 mm. Find the difference of pressure head at two points.

    d)   Compare laminar and turbulent flow.

    e)   State Darcy's formula for loss of head. Name the variables.

    f)   Explain hydraulic gradient line and total energy line.

Marks

3. Attempt any FOUR of the following: 16

a) A jet of water 50 mm in diameter strikes on a fixed plate normally with a velocity of 25 m/s. Find the force exerted on flat plate.

b) Derive an expression for the force exerted by a jet of water on a moving inclined plate.

c) Classify turbines according to following.

   (i) head at the inlet of turbine.

   (ii) the direction of flow through runner.

d) Draw inlet and outlet velocity triangles for pelton wheel. State the meaning of each term.

e) A conial pipe having end diameters 100 mm and 150 mm is used to supply oil. Find discharge through pipe. The velocity of oil flowing through pipe at smaller diameter side is 5 m/s. Also find velocity at larger end side.

f) Draw a labelled diagram of two stage centrifugal pump joined in parallel.

4. Attempt any TWO of the following: 16

a) A centrifugal pump is to discharge 0.130 m^3/s at a speed of 1200 rpm against a total head of 20 meter. The impeller diameter is 250 mm, its width at outlet is 40 mm and manometric efficiency is 75%. Determine the vane angle at the outer periphery of the impeller.

b) A pelton wheel working under a head of 50 meters, develops 80 kW at 230 rpm. Calculate the diameter of jet if overall efficiency is 78%. (Assume C_v = 0.98)

c) With a neat, labelled sketch explain the working of kaplan turbine.

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

   a) (i) Compare Francis and Kaplan turbine on the basis of construction and working.

      (ii) State the function of air vessel on suction and delivery side of reciprocating pump.

   b) Compare centrifugal pump with reciprocating pump. (at least eight points)

   c) The difference in water surface level in two tanks is 10 meter, which are connected by three pipes in series of length 300 m, 150 m and 200 m and diameters are 0.3 m, 0.2 m, and 0.4 m respectively. Determine the rate of flow of water if the coefficient of friction for pipes is 0.0005, 0.0052 and 0.0048 respectively. Consider all minor losses.

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

   a) Explain the working of double acting reciprocating pump with neat sketch.

   b) Define coefficient of discharge and write equation for actual discharge.

   c) Convert vacuum gauge reading 200 mm of Hg into absolute pressure in N/mm^2.

   d) Define manometric head and manometric efficiency.

   e) Define compressible and incompressible flow.

   f) Explain any two types of impeller with neat sketch.

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