22445

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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) Define viscosity and viscosity index.

b) Convert 3.2 bar pressure into equivalent mercury column.

c) State the types of fluid flow.

d) Define water hammer effect.

e) State laws of fluid friction for laminar flow.

f) Define draft tube and name any two types of draft tube.

g) Define for centrifugal pump

   i)   NPSH

   ii) Manometric efficiency

Marks

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

   a) Explain simple U-tube differential manometer with neat sketch.

   b) The circular plate of 1.6 m diameter is emersed vertically in a water such that it's centre is 4 m below the free water surface. Find depth of centre of pressure and total pressure.

   c) Describe with neat sketch, construction and working principle of orificemeter.

   d) Explain the various energees passessed by a flowing fluid.

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

   a) Calculate the velocity at the end of the pipe of diameter 160 mm and 210 mm connected in series having discharge of 50 lit/min.

   b) Write short notes on hydraulic power transmission through pipes.

   c) The reservoir built 6 km away from town has to supply water at the rate of 800 lit/min. Calculate the size of supply pipe if the head loss due to friction and others in pipe is 20 m. Take coefficient of friction is 0.008.

   d) Find equation for force and work done for the impact of jet on moving vertical plate.

   e) A jet of water 15 cm diameter strike on a flat plate with velocity of 20 m/sec The plate is moving with a velocity of 9m/sec in the direction of jet and away from the jet. Find the efficiency of jet.

4. **Attempt any <u>THREE</u> of the following:**   **12**

   a) Explain general layout of hydraulic power plant.

   b) State function of draft tube in reaction turbine. Explain any one in detail.

   c) A pelton wheel is having a mean bucket diameter of 1.5 m and is running at 800 r.p.m. The net head on pelton wheel is 700 m. If jet gets deflected throught an angle of 165° and discharge through nozzle is 0.1m^3/sec.

     Find

     i) Power available at the nozzle

     ii) Hydraulic efficiency of turbine.

   d) Define the following terms with respect to centrifugal pump.

     i) Total head

     ii) Manometric head

   e) State any three troubles shooting and their remedies commonly experienced during operation of centrifugal pump.

5. **Attempt any <u>TWO</u> of the following:**   **12**

   a) An orifice meter with orifice diameter 20 cm is inserted in a pipe of 40 cm diameter. The pressure difference measured by a mercury oil differential manometer on the two side of the orifice meter gives a reading of 60 cm of mercury. Find the rate of flow of oil of specific gravity 0.9, when the coefficient of discharge of the meter is 0.64.

   b) Find maximum power that can be transmitted by power station through hydraulic pipe 4 Km long and 0.2 m diameter. The intensity of pressure available is 50 bars. Take $f = 0.0075$.

   c) Derive an expression for the force exerted by a jet of water on a moving inclined plate. Also draw the neat sketch. Also find work done.

Marks

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

   a) Explain with a neat sketch, the construction and working of pelton wheel.

   b) A centrifugal pump works against 10 m at 800 rpm the vanes are curved back at an angle 30° to the tangent at outer periphery. The impeller diameter is 30 cm and has width 5 cm at outlet. Determine the discharge of manometric efficiency is 95%. Also determine power required to operate the pump if overall efficiency is 70%.

   c) Compare centrifugal pump with reciprocating pump. (at least six points)

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