22445

12223

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 answer 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 fluid pressure intensity and pressure head.

b) Convert 10 N/cm^2 pressure in oil column of specific gravity 0.82.

c) State the types of Fluid flow.

d) State the various minor losses in the pipe.

e) Write Chezy's equation. State the meaning of each term.

f) State the necessity of draft tube for every reaction turbine.

g) Define the following terms-

   i)   NPSH

   ii) Negative slip.

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

    a) Different pressure gauges shows following sets of reading

        i)   100 kg_f/cm^2

        ii)   15 bar convert it into N/mm^2 and N/m^2.

    b) A circular plate 3m. diameter is immersed in water in such a way that its greatest and least depth below the free surface of water are 4m and 1m respectively Determine the total pressure and position of center of pressure.

    c) Derive the equation for coefficient of discharge [Cd] for Venturimeter.

    d) Explain with neat sketch the procedure for measuring velocity in pipe using Pitot tube.

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

    a) A Venturimeter is installed in a pipeline of 30cm diameter, the difference of pressure at entrance and throat read by mercury manometer is 5cm. When the water flows at a rate of $0.05m^3$/sec. If the discharge coefficient of meter is 0.96, determine the diameter of throat.

    b) Explain H.G.L and T.E.L with neat sketch.

    c) State the equation for hydraulic power transmission through pipe and obtain the condition for maximum power transmission.

    d) Derive an expression for force exerted by jet on stationary inclined flat plate in direction of jet.

    e) A horizontal jet of water is delivered under an effective head of 25m. Calculate the diameter of jet if the force exerted by the jet on a vertical fixed plate is 2.22kN Take coefficient of Velocity as 0.99.

Marks

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

   a) Differentiate between Francis Turbine and Kaplan Turbine. (Any Four Points).

   b) Classify turbines according to following-

      i)   Head at the inlet of turbine.

      ii)   The direction of flow of water through runner.

   c) A Pelton wheel bucket is 1m in diameter. Pressure head at nozzle when it is closed is 15 bar. The discharge when Nozzle is open is $3.5 m^3$/min. If speed is 600 RPM, Calculate power developed and hydraulic efficiency.

   d) Define the following w.r.t centrifugal pump.

      i)   Manometric head

      ii)   Manometric efficiency.

   e) Explain the working of double acting Reciprocating pump with neat sketch.

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

   a) A Pitot tube was used to measure the quantity of water flowing in a pipe of 0.3m diameter. The water was raised to a height of 0.25m above the centerline of pipe in a vertical limb of the tube. If the mean velocity is 0.78 times the velocity at center and coefficient of pitot tube is 0.98, find the quantity of water in lit/sec. Static pressure head at centre of the pipe is 0.2m.

   b) Find the maximum power that can be transmitted by a power station through a hydraulic pipe 3km long and 0.2m diameter. The pressure at the power station is 60 bars. Take f = 0.0075.

   c) A jet of water 80mm diameter moving with a velocity 20m/sec, strikes a stationary plate. Find the normal force on the plate, when

      i)   The plate is normal to the jet.

      ii)   The angle between jet and plate is 30°

Marks

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

a) Explain the construction and working principle of Pelton wheel turbine with neat sketch.

b) A centrifugal pump is to discharge water at the rate of 110 lit/sec at the speed of 1450 rpm against head of 13m. Impeller diameter is 250mm and its width is 50mm. If manometric efficiency is 75%, determine Vane angle at outer periphery.

c) Centrifugal pump not delivering water, give at least three reasons and remedies.

————