

22445

12223

3 Hours / 70 Marks

Seat No. 

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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  $10 \text{ N/cm}^2$  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.

P.T.O.

2. Attempt any THREE of the following:

- a) Different pressure gauges shows following sets of reading
  - i) 100 kg/cm<sup>2</sup>
  - ii) 15 bar convert it into N/mm<sup>2</sup> and N/m<sup>2</sup>.
- 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 THREE 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<sup>3</sup>/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.

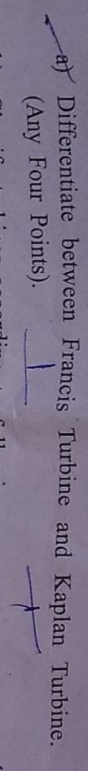
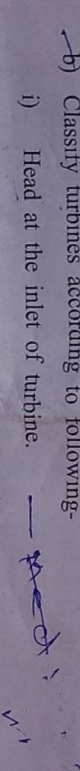
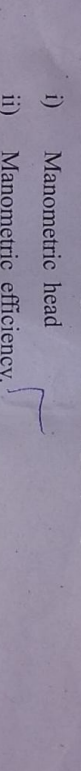
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[ 3 ]

Marks

12

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

- 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  $3.5\text{m}^3/\text{min}$ . 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  $30^\circ$

P.T.O.

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.

