

22445

23242

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 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. Attempt any FIVE of the following. **10****
- a) Define specific gravity of fluid and write its standard value of water.
 - b) For a water column of height 8 m calculate
 - i) Intensity of pressure (Kpa)
 - ii) mm of mercury.
 - c) Define the term - Barometric pressure
 - d) What is the term 'vena-contracta' related to orifice meter?
 - e) State the law of fluid friction for turbulent flow.
 - f) List any four commonly used draft tubes.
 - g) State the advantages of reciprocating pump over the centrifugal pump (any two).

P.T.O.

2. Attempt any **THREE** of the following. 12
- a) A closed tank contains 0.5 m of mercury, 1.5 m of water and 2.5 m of oil of specific gravity 0.8 and air above the oil. If pressure at the bottom of tank 4 kg/cm² gauge. What should be the reading of gauge at the top of the tank?
 - b) A circular plate 3 m in diameter is immersed in water in such away that greatest and least depth below the free surface are 4 m and 1.5 m respectively. Determine the total pressure and position of centre of pressure.
 - c) Derive on equation for actual discharge through venturimeter.
 - d) Explain the working principal of orifice meter with neat sketch.
3. Attempt any **THREE** of the following. 12
- a) A pitot tube records of 7.85 kN/m² as the stagnation pressure when it is head at the centre of pipe of 250 mm diameter conveying water. The Static pressure in the pipe is 40 mm of Hg. Calculate the discharge through the pipe assuming the mean velocity of flow is 0.8 times the maximum velocity. Take $C_v = 0.98$.
 - b) Write two effects and two remedial measures for water hammer.
 - c) Water is flowing through a horizontal pipe of diameter 200 mm at a velocity of 3 m/sec. A circular solid plate of diameter 150 mm is placed in the pipe to obstruct the flow. Find the loss of head due to obstruction in the pipe. If $C_c = 0.62$.
 - d) A 7 cm diameter jet having a velocity of 30 m/sec. strikes a flat plate which is inclined at 45° the axis of the jet. Find the normal pressure on the plate if-
 - i) Plate is stationary
 - ii) Plate is moving with a velocity of 15 m/sec.
 - e) Draw inlet and outlet velocity diagram of impact of jet strikes tangentially at one tips on the moving curved vanes.

4. Attempt any THREE of the following. 12

- a) Compare Impulse and Reaction turbine with reference to following points.
 - i) Working Principle
 - ii) Energy available at nozzle
 - iii) Head available
 - iv) Loss of head
- b) Explain with neat sketch governing of a pelton wheel turbine.
- c) A Kaplan turbine works under a head of 11 meters and runs at 95 rpm. The outlet vane angle at the extreme edge of the runner is 20° . The boss diameter is $\frac{1}{3}$ of the diameter of the runner. The flow ratio is 0.5. Determine the diameter of runner and boss. Assume the whirl at outlet to be zero.
- d) Write the types of impellers and casing of centrifugal pump. Explain any one in brief.
- e) A centrifugal pump is to discharge water at the rate of 110 lit/sec at the speed of 1450 rpm against head of 13 m impeller diameter is 250 mm and its width is 50 mm. If the manometric efficiency is 75%. Determine vane angle at outer periphery.

5. Attempt any TWO of the following. 12

- a) A venturimeter has an ration 9:1, the larger diameter being 300 mm during the flow, the recorded pressure head in the larger section is 6.5 meter and that of the throat 4.25m if the meter coefficient $[c] = 0.99$. Compute the discharge through the metre.
- b) A 4.25 mm diameter pipe having 800 m length conveys water from high level tank to a point 22 m below the water level in the tank. Calculate the percentage error committed in the calculation of discharge by neglecting the minor energy losses. Take $f = 0.03$
- c) Draw a neat sketch of impact of jet on inclined fixed plate and write formulae for various forces exerted on it.

6. Attempt any TWO of the following. 12

- a) Explain with neat sketch construction and working of kaplan turbine.
 - b) Explain construction, working principle and application of double acting reciprocating pumps.
 - c) A centrifugal pump delivers 1.27 m^3 of water per minute at 1200 rpm. The impeller diameter is 350 mm and breadth at outlet 12.7 mm. The pressure difference between inlet and outlet of pump casing is 272 kN/m^2 . Assuming manometric efficiency as 63%. Calculate the impeller exit blade angle.
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