

313309

12526

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) The density of a liquid is 2900 kg/m^3 . Calculate the specific gravity of the liquid.
- b) State the Bernoulli's theorem.
- c) State the causes and remedial measures to avoid water hammer.
- d) State the function of draft tube in reaction water turbine.
- e) Classify the water turbines.
- f) State the need of priming in centrifugal pump.
- g) State the use of air vessel in reciprocating pump.

P.T.O.

- 2. Attempt any THREE of the following: 12**
- a) Explain construction and working of Bourdon tube pressure gauge with neat sketch.
 - b) Define the following types of the fluid flow.
 - i) Steady flow
 - ii) Uniform flow
 - iii) Turbulent flow
 - iv) Rotational flow.
 - c) A venturimeter is installed in a pipe line of 30 cm diameter. The difference of pressure at entrance and throat read by mercury manometer is 5 cm, when water flows at a rate of $0.05 \text{ m}^3/\text{sec}$. If the coefficient for venturimeter is 0.96, determine the diameter of the throat.
 - d) With neat sketch explain construction and working of pitot tube.
- 3. Attempt any THREE of the following: 12**
- a) With the help of a neat sketch explain Hydraulic gradient line and total energy line.
 - b) State the meaning of minor losses and list the various minor losses in flow through pipes with appropriate formulae.
 - c) A pipe of a diameter 300 mm and length 3500 m is used for the transmission of power by water. The total head at the inlet of the pipe is 500 m. Find the maximum power available at the outlet of the pipe, if the value of $f = 0.006$.
 - d) Explain the working of hydraulic power plant with neat labelled layout.
- 4. Attempt any THREE of the following: 12**
- a) Compare impulse water turbine with reaction water turbine.
 - b) A jet of water 80 mm diameter moving with a velocity 20 m/s, strikes a stationary flat 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° .
 - c) Explain with neat sketch construction and working of double acting reciprocating pump.

- d) Explain the multistage pumps. State its advantages and applications.
- e) A centrifugal pump has an impeller of 500 mm external diameter and 250 mm internal diameter, runs at 1000 rpm. The vanes are set back at an angle of 30° to outer rim. If the radial velocity of water through impeller is maintained constant at 2 m/s. Find :-
- Angle of inlet
 - Velocity of water at outlet.
 - Workdone when velocity at inlet circumference of the wheel is half the velocity of outer circumference of the wheel.

5. Attempt any TWO of the following:

12

- a) A vertical composite liquid column with its upper and exposed to atmosphere, comprises of 45 cm of Hg (Sp. gravity 13.6), 65 cm of water and 80 cm of oil which is having sp. gravity as 0.8. Calculate the absolute pressure in bar :-
- At the bottom of column
 - At the interface of oil and water.
- b) A pelton wheel is designed for following specifications :
- Shaft power = 11772 kw, head = 380 m speed = 750 rpm, overall efficiency = 86%. If the jet diameter should not be exceed $\frac{1}{6}$ th the wheel diameter, determine wheel diameter, number of jets required and diameter of jet.
- (Take speed ratio = 0.45)
- c) A jet of water having velocity of 15 m/s strikes a curved vane which is moving with a velocity of 5 m/s in the same direction as that of jet at inlet. The vane is so shaped that the jet is deflected through 135° . The diameter of jet is 100 mm. Assume vane to be smooth. Find :-
- Force exerted by the jet on the vane in the direction of motion.
 - Output power of the vane
 - Efficiency of vane.

P.T.O.

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

- a) A simple U-tube manometer containing Hg is connected to a pipe in which a fluid of sp. gravity 0.8 and having vacume pressure is flowing, the other end of manometer is open to atmosphere. Find the vacume pressure in the pipe, if the difference of Hg level in the two limbs is 40 cm and the height of fluid in the left limb from the centre of pipe is 15 cm below.
 - b) With neat sketch explain the performance characteristics curves for hydraulic turbines.
 - c) Draw and explain indicator diagram showing combined effect of friction head and acceleration head for single acting reciprocating pump.
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