

313309

12425

03 Hours / 70 Marks

Seat No.

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- Instructions* – (1) All Questions are *Compulsory*.
(2) Illustrate your answers with neat sketches wherever necessary.
(3) Figures to the right indicate full marks.
(4) Assume suitable data, if necessary.
(5) Use of Non-programmable Electronic Pocket Calculator is permissible.
(6) 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) One liter of oil weighs 7.8 N. Calculate specific gravity of oil.
 - b) State Continuity equation and write the expression for it.
 - c) Show the difference between hydraulic gradient line and total energy line with the help of suitable diagram.
 - d) List any four types of draft tubes used in reaction turbine.
 - e) State the need of surge tank in hydroelectric power plant
 - f) Compare single acting and double acting reciprocating pump on the basis of nature and quantity of discharge.
 - g) Define NPSH.

P.T.O.

2. Attempt any THREE of the following :

12

- a) A circular plate of diameter 1.5 m placed vertically in water in such a way that the center of the plate is 2.5 m below the free surface of water. Determine:
 - (i) Total pressure on the plate.
 - (ii) Position of center of pressure.
- b) Explain the concept of atmospheric pressure, gauge pressure and vacuum pressure with a neat sketch.
- c) As shown in Figure 1, a differential manometer connected at two points A and B. At 'A' air pressure is 100 kN/m^2 . Find the absolute pressure at B.

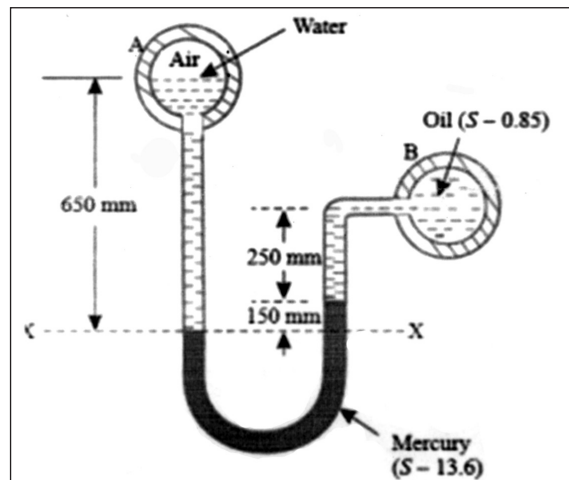


Fig. No. 1

- d) Draw neat sketch of Bourdon's tube pressure gauge and compare it with Manometers on the basis of range and working principle.

3. Attempt any THREE of the following :

12

- a) A $300 \text{ mm} \times 100 \text{ mm}$ Venturi meter has C_d equal to 0.93. The pipe delivers water at the rate of 1000 litre/min. What will be the pressure difference between inlet and the throat of venturimeter?
- b) Explain water hammer phenomenon and state the remedial measures to avoid it.

- c) Define hydraulic coefficients C_d , C_v , C_c and state relation between them
- d) Explain with neat sketch, construction and working principle of Pitot tube.

4. Attempt any THREE of the following : 12

- a) A 3000 m long pipeline is used for transmission of power. 145 kW power is to be transmitted through the pipe in which water having a pressure of 4000 KN/m^2 at inlet is flowing. If the pressure drop over the length of pipe is 800 KN/m^2 and $f = 0.006$, find -
 - i) Diameter of the pipe, and
 - ii) Efficiency of transmission.
- b) State laws of fluid friction for turbulent flow.
- c) Draw neat sketch and state advantages of Air vessel in reciprocating pump.
- d) State any four faults in centrifugal pump and their remedies.
- e) Discuss the factors considered for selection of turbine.

5. Attempt any TWO of the following : 12

- a) Explain with neat sketch construction, working principle and velocity diagram of Kaplan turbine
- b) A jet of water of diameter 60 mm moving with a velocity of 18 m/s, strikes flat plate, moving with a velocity of 6 m/s in the direction of jet, at the center. Find -
 - i) Thrust on plate in the direction of jet. If the flat plate is replaced by the symmetrical curved vane moving with the same velocity and the jet after striking is deflected through an angle of 165° at outlet of curved plate, find -
 - ii) Thrust on plate in the direction of jet, and
 - iii) Work done.

- c) A single jet Pelton wheel runs at 280 rpm under a head of 510 meter. The jet diameter is 200 mm, its deflection inside the bucket is 165° and its relative velocity is reduced by 15% due to friction. Determine -
- Water power
 - Resultant force on the bucket and
 - Overall efficiency. Consider mechanical losses = 3%,
Co-efficient of velocity = 0.98 and speed ratio = 0.46

6. Attempt any TWO of the following :

12

- Draw and explain performance characteristics curves for hydraulic turbine.
 - A centrifugal pump having outer diameter equal to two times the inner diameter and running at 900 rpm works against a total head of 60 m. Velocity of flow through impeller is constant and equal to 3 m/s. The vanes are set back at an angle at 40° at outlet. If diameter of impeller is 600 mm and width at outlet is 60 mm. Calculate -
 - Discharge
 - Vane angle at inlet
 - W.D. by impeller on water per second.
 - Manometric efficiency.
 - Power required to drive the pump if overall efficiency is 70%.
 - Explain with neat sketch construction, working and applications of multistage pump
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