

313309

25226

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.

Marks

1. Attempt any FIVE of the following :

10

- (a) Define :
 - (i) Capillarity
 - (ii) Vapour pressure
- (b) State various types of fluid flow.
- (c) State the laws of fluid friction for laminar flow.
- (d) State the function of draft tube and name any two types of draft tube.
- (e) Write the formula for force exerted by a jet on flat vertical plate moving in direction of jet.
- (f) List the methods of priming of a centrifugal pump.
- (g) Draw indicator diagram for reciprocating pump showing the effect of accelerating head and friction head.



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

- (a) A circular plate 3 m diameter is immersed in water in such a way that its greatest and least depth below the free surface of water are 4 m and 1 m respectively. Determine total pressure and position of centre of pressure.
- (b) Describe with neat sketch, construction and working principle of venturimeter.
- (c) Explain Bernoulli's theorem with neat sketch. State its two important assumptions.
- (d) An orifice meter with orifice diameter 10 cm is inserted in a pipe of 20 cm diameter. The pressure gauges fitted upstream and downstream of the orifice meter shows readings 19.62 N/cm^2 and 9.81 N/cm^2 respectively. The coefficient of discharge for meter is 0.6. Find the discharge of water through pipe.

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

- (a) Write two effects and two remedial measures for water hammer.
- (b) Explain the term hydraulic gradient and total energy lines with diagram.
- (c) A reservoir built 5 km away from town has to supply water at the rate of 1000 lit./min. Calculate the size of supply pipe if the head loss due to friction and other in pipe is 20 m. Take coefficient of friction as 0.008.
- (d) State the names of turbine for following condition :
 - (i) High speed minimum discharge
 - (ii) Minimum discharge high head
 - (iii) Moderate discharge and head
 - (iv) Maximum discharge and low head

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

- (a) Draw the layout of hydroelectric power plant and classify the turbines used in it.
- (b) A jet of water moving at 20 m/s impinges on a symmetrical curved vane shaped to deflect the jet through 120° (that is the vane angle θ and ϕ are equal to 30°). If the vane is moving at 5 m/s., find the angles of the jet so that there is no shock at inlet. Also determine the absolute velocity of exit in magnitude and direction and the work done.
- (c) Draw and explain main characteristics curves of centrifugal pump in discharge vs. overall efficiency.
- (d) Write the type of impellers and casing of centrifugal pump. Explain any one in brief.
- (e) Discuss the factors considered for selection of pump.

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

- (a) Explain pressure measurement using differential 'U' tube manometer with neat sketch.
- (b) A Pelton wheel 2.5 m diameter operates under following conditions :
 - (i) Net available head (H) = 400 m
 - (ii) Speed (N) = 250 r.p.m.
 - (iii) Coefficient of velocity of jet (C_v) = 0.98
 - (iv) Friction coefficient for vanes (K) = 0.95
 - (v) Blade angle (ϕ) = 15°
 - (vi) Diameter of jet (d) = 25 cm
 - (vii) Mechanical efficiency (η_m) = 0.90

Determine :

- (1) The power developed
- (2) Hydraulic efficiency
- (3) Specific speed

P.T.O.

- (c) A jet of water 75 mm diameter having a velocity of 20 m/s, strikes normally a flat smooth plate, determine the thrust on the plate :
- (i) If the plate is at rest
 - (ii) If the plate is moving in the same direction as the jet with velocity of 5 m/s. Also find the work done per second on the plate in each case and the efficiency of the jet when plate is moving.

6. Attempt any TWO of the following :

12

- (a) A centrifugal pump has the following characteristics :
- Outer diameter of impeller = 800 mm,
Width of impeller vanes at outlet = 100 mm
Angle of impeller vanes at outlet = 40°
- The impeller runs at 550 r.p.m. and delivers 0.98 m^3 of water per second under an effective head of 35 m. A 500 kN motor is used to drive the pump. Determine :
- (i) Monometric efficiency
 - (ii) Overall efficiency of pump and
 - (iii) Mechanical efficiency
- (b) A different pressure gauges shows following sets of reading :
- (i) 50 p.s.i.
 - (ii) 100 kgf/cm^2
 - (iii) 15 bar
- Convert it into N/mm^2 and N/m^2
- (c) Draw and explain performance characteristic curves of Pelton turbine.
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