22445

11920

3 Hours / 70 Marks Seat No. | | | | | | | | |

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) 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) Compare water and oil of sp. gravity 0.8 on the basis of density and viscosity.

b) The pressure in the tyres of four wheeler was measured as 33. State the unit of the pressure in this case. Name the device used to measure this pressure.

c) Show the difference between hydraulic gradient line and total energy line with the help of suitable diagram.

d) Write Chezy's equation for frictional losses and list all the terms involved in it.

e) State the need of surge tank in hydroelectric power plant.

f) State the difference between Static head and Manometric head in centrifugal pump.

g) Draw indicator diagram for reciprocating pump showing the effect of accelerating head and frictional head.

Marks

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

a) Draw sketch of Bourdon tube pressure gauge and state its advantages.

b) A circular plate 3.5 m diameter is fully immersed in water at an angle of 45° with the vertical. Determine the total pressure and centre of pressure on the plate when its centre is 3 m below the free surface of water.

c) Explain Bernoulli's theorem with neat sketch. State its two important assumptions.

d) Compare:

(i) Steady and uniform flow

(ii) Laminar and Turbulent flow

(two imp. points)

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

a) An oil of specific gravity 0.7 is flowing through venturimeter having inlet diameter 35 cm and throat diameter 20 cm. The oil-mercury differential manometer shows a reading of 30 cm. Calculate discharge of oil through the horizontal venturimeter. Take Cd = 0.98.

b) Explain water hammer phenomenon and state the remedial measures to avoid it.

c) List various minor losses in fluid flow. Explain any one type with sketch and formula.

d) Draw the velocity diagram for the symmetrical and moving curved vane when jet strikes at one end with certain velocity at certain angle and leaning the vane from other end. State the meaning of terminologies used in the diagram.

e) A jet of water of diameter 30 mm moving with velocity of 35 m/s, strikes a curved fixed symmetrical plate at the centre. Find the force exerted by jet of water in the direction of jet, if jet is deflected through an angles of 150° at outlet of curved plate. If the vane is moving with the velocity of 20 m/s in the direction of jet, find out the force exerted.

Marks

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

a) Draw the layout of hydroelectric power plant and classify the turbines used in it.

b) Explain the need of draft tube in reaction turbine. State the types of draft tube used in it.

c) Draw and explain performance characteristic curves of Pelton turbine.

d) State any four faults in centrifugal pump and their remedies.

e) Discuss the factors considered for selection of pump.

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

a) Derive equation for discharge through orifice meter with the help of neat sketch.

b) A pipe line 2000 m long carries water having pressure of 50 bar at inlet. The pressure drop over the length of pipe is 1000 kN/m^2. If the power transmitted through pipe is 110 kw and coefficient of friction is 0.0055, find

(i) Diameter of pipe and

(ii) Efficiency of transmission.

c) A jet moving with a velocity of V m/s is made to strike a stationary

(i) flat plate normally,

(ii) flat plate inclined at an angle θ and

(iii) symmetrical curved vane at centre with tip angle θ.
In which case the force exerted by the jet is maximum? Justify with suitable sketch and formulas.

Marks

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

a) Explain construction and working of Francis turbine with neat sketch.

b) A centrifugal pump delivers water against a net head of 14.5 m and a design speed of 1000 rpm. The vanes are curved back at an angle of 30° with the periphery. The impeller diameter is 300 mm and outlet width is 50 mm. Determine the discharge of the pump and power required to drive the pump if manometric efficiency is 95% and overall efficiency is 90%.

c) A single acting reciprocating pump running at 50 rpm delivers 0.00736 m^3/s of water. The diameter of piston is 200 mm and stroke length is 300 mm, the suction and delivery heads are 3.5 m and 11.5 m respectively. Determine

(i) Theoretical discharge

(ii) Slip

(iii) Power required to run the pump.