

T.E. Civil - V

(3 Hours)

Total Marks 80

40 + 36 + 17

24.11.23

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- Note: 1. Q.No.1 is compulsory.
2. Attempt any three questions out of remaining five questions.
3. Assume any data if required stating clearly.

- Q.No.1 Attempt any four questions 20
- Draw the neat sketch of Layout of hydroelectric power plant
 - Define specific speed of centrifugal pump and derive its expression
 - Explain briefly various types of surface profiles in open channel
 - Derive conditions for most economical rectangular channel section
 - Classify the jumps based of Froude No.
- Q.No.2.(a) (a) A jet of water of diameter 25 mm strikes a 200 mm x 200 mm square plate of uniform thickness with a velocity of 10 m/s at the centre of the plate which is suspended vertically by a hinge on its top horizontal edge. The weight of plate is 100 N. The jet strikes normal to the plate. What force must be applied at the lower edge of the plate to keep it vertical? What will be inclination of plate with vertical due to force exerted by jet of water, if plate is allowed to deflect freely 10
- (b) A jet of water of diameter 60 mm moving vertically with a velocity 28 m/s impinges on a fixed curved plate tangentially at one end at an angle of 30° to the horizontal. Calculate the resultant force of the jet on the plate if the jet is deflected through an angle of 50° . 10
- Q.No.3 (a) Determine the power given by the jet of water to the runner of a Pelton Wheel which is having tangential 25 m/s. The net head on the turbine is 60 mt and discharge through the jet of water is $0.025 \text{ m}^3/\text{s}$. The side clearance angle is 15° and take $C_v=0.97$ 10
- (b) An inward flow reaction turbine has external and internal diameters as 1.2 m and 0.6 m respectively. The hydraulic efficiency of turbine is 88% when the head on the turbine is 40 mt. The velocity of flow at outlet is 3 m/s and discharge at outlet is radial. If the vane angle at outlet is 15° and the width of the wheel is 90 mm at inlet and outlet, determine (i) the guide blade angle (ii) speed of turbine (iii) vane angle of the runner at inlet (iv) Volume flow rate of turbine 10
- Q.No.4 (a) The outer diameter of an impeller of a centrifugal pump is 380 mm and outlet width is 50 mm. The pump is running at 780 rpm and is working against head of 16 m. The vanes angle at outlet is 40° and manometric efficiency is 78 % Determine (i) velocity of flow at outlet (ii) velocity of water leaving the vane (iii) angle made by absolute velocity at outlet (iv) discharge 10

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- (b) (i) Explain Hydraulic Crane 05
(ii) Write short notes on Hydraulic accumulator 05
- Q.No.5(a) Calculate the quantity of water that will be discharged at an uniform depth of 1.0 mt in a 1.4 mt diameter circular channel (pipe) which is laid at a slope of 1 in 1200. Assume Chezy's $C=60$. 10
- (b) A trapezoidal channel section with side slope $1H : 1V$ has to be designed to carry a discharge of $12 \text{ m}^3/\text{sec}$ at a velocity of 2.5 m/s so that the amount of lining for the bed and sides is to be most economical. Calculate the area of lining required for one mt length of canal. 10
- Q.No.6 (a) Derive the expression for depth of hydraulic jump. 10
- (b) (i) Explain briefly specific energy curve with neat sketch. 10
(ii) The specific energy for a 4 mt wide rectangular channel is to be 4 Nm/m . If the rate of flow of water through channel is $16 \text{ m}^3/\text{s}$, determine the alternate depth of flow