05.06.2025

TE(CIVIL)/Sem-V/ R-19) 'C' scheme

(Time : 3 Hours)
(Total Marks 80)

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	5x4=20
(a)	Obtain an expression for the force exerted by a jet of water on a fixed vertical plate in the direction of the jet.	
(b)	Draw the neat sketch of hydroelectric power plant.	
(c)	Explain briefly classification of hydraulic turbine.	
(d)	Derive conditions for most economical rectangular channel section.	
(e)	Draw and explain briefly Specific Energy Curve.	

Q.No.2.(a) (a) A jet of water of diameter 25 mm strikes hinged square plate at its centre with a velocity of 15 m/s. The plate is deflected through an angle of 20^0. Find the weight of the plate. If the plate is not allowed to swing what will be the force required at the lower edge of the plate to keep the plate in vertical position — **10**

(b) A jet of water of diameter 75 mm strikes a curved plate at its centre with a velocity of 20 m/s. The curved plate is moving with a velocity of 8 m/s in the direction of the jet. The jet is deflected through of 165^0. Assuming the plate smooth, find: (i) Force exerted on the plate in the direction of jet (ii) Power of the jet (iii) Efficiency of the jet — **10**

Q.No.3 (a) A Pelton wheel is to be designed for a head of 60 m when running at 200 rpm. The Pelton wheel develops 100 KW shaft power. The velocity of bucket is 0.50 times the velocity of the jet, overall efficiency is 90% and coefficient of the velocity is equal is 0.98 — **10**

(b) A Kaplan turbine working under a head of 22 m develops 12000 kW shaft power. The outer diameter of the runner 3.5 m and hub diameter 1.75 m. The guide blade angle at the extreme edge of the runner is 35^0. The hydraulic and overall efficiencies of the turbines are 88% and 83% respectively. If the velocity of whirl is zero at outlet, determine
(i) runner vane angles at inlet and outlet at the extreme edge of runner and (ii) Speed of the turbine — **10**

Q.No.4 (a) A single stage centrifugal pump with impeller diameter of 30 cm rotates at 2000 rpm and lifts water at the rate of 4 m^3/s to a height of 32 mt with an efficiency of 75%. Find the number of stages and diameter of each impeller of a similar multistage pump to lift water the rate of 5 m^3/s to a height of 220 mt when running at 1500 rpm. — **10**

(b) (i) Explain Hydraulic Crane
(ii) Write short notes on Hydraulic Press — **5x2=10**

q P Code: 66935

Prog. Code: 1T00635

Q.No.5(a) Derive the conditions for most economical trapezoidal channel.   10

(b) A concrete lined circular channel of diameter 3 m has a bed slope of 1 in 500.   10
Workout the velocity and flow rate for the condition of (i) Maximum Velocity
and (ii) Maximum Discharge. Take Chezy's Constant =50

Q.No.6 (a) Derive the expression for gradually varied flow and state assumptions.   10

(b) (i) Explain briefly various surface profiles with neat sketches.   5x2=10
(ii) The discharge of water through a 6 mt wide rectangular channel is 20
cumec when the depth of flow is 2 mt. Calculate (i) Specific Energy of the
flowing water (ii) Critical depth (iii) Critical Velocity and Minimum Specific
Energy

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