13/11/24

(Time: 3 Hours) TE/civil/sem-V/CBCGS/R/19/c-scheme/SH-24 (Total Marks: 80)

QP-10066937

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.1 Attempt **ANY FOUR**

a.	Derive the equation of impact of jets on flat stationary vanes.		**05**
b.	Derive conditions for most economical trapezoidal channel section		**05**
c.	Define specific speed of centrifugal pump and derive its expression.		**05**
d.	Draw the neat sketch of layout of hydroelectric power plant.		**05**
e.	Classify the jumps based on Froud's number.		**05**

Q.2

a.	Derive the expression for torque exerted on a series of radial curved plate.		**10**
b.	A jet of water discharge 140 m^3/s at 40 m/s in the direction making 30^0 to the direction of series of curved vanes moving at 17.5 m/s. If outlet angle of vane is 20^0 determine a) The inlet vane angle, so that there is no shock at entry. b) Direction of flow at outlet. c) Work done per second.		**10**

Q.3

a.	Obtain an expression for unit speed, unit discharge and unit power of turbine.		**10**
b.	An outward flow reaction turbine has internal and external diameter of runner as 0.6 and 1.2m respectively. The guide blade angles is 15^0 and velocity of flow through runner is constant and equal to 4 m/s. If the speed of the turbine is 200 rpm, head on the turbine is 10m and discharge at outlet is radial determine a) Runner vane angle at inlet and outlet b) Work done by water on runner c) Hydraulic efficiency.		**10**

Q.4

a.	Explain construction and working of centrifugal pump with diagram.		**10**
b.	Three stage centrifugal pump has impellers 40 cm diameter and 2 cm wide at outlet. The vane is curved back at the outlet at 45 degree and reduce the circumferential area by 10%. Its manometric efficiency is 90% and overall efficiency is 80%. Determine the head generated by the pump when running at 1000 rpm. Delivering 50 LPS. What should be the shaft power and specific speed?		**10**

Q.5

a.	Draw and explain in detail Hydraulic ram		**05**
b.	Differentiate between flow through pipe and open channel flow.		**05**
c.	The rate of flow through a trapezoidal open channel is 20 m^3/s and the mean velocity of flow is 1 m/s. The side slope is 1:1 and the bed slope is 1 in 5000. Take C=60. Determine the bottom width and depth of water in the channel.		**10**

Q.6

a.	Derive expression for critical depth of rectangular channel section.		**10**
b.	A rectangular channel section has a width of 3m and carries a discharge of 3 m^3/s with a depth of 0.3 m Calculate: a) Specific energy. b) Critical depth. c) Critical velocity d) Minimum Energy		**10**

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