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B.E. / B.TECH. DEGREE EXAMINATIONS, DEC 2019

Fourth Semester

CE16402 – APPLIED HYDRAULIC ENGINEERING*(Civil Engineering)***(Regulation 2016)****Time: Three Hours****Maximum : 100 Marks**Answer **ALL** questions**PART A - (10 X 2 = 20 Marks)**

		CO	RBT
1.	Write the dimension of Constant C in Chezy's formula.	1	R
2.	Water flows in a rectangular concrete open channel which is 12m wide and depth of flow of water is 2.5m. The channel slope is 1 in 350. Find water velocity and rate of flow in cumecs. Assume $n = 0.013$	1	U
3.	Write the dynamic equation for gradually varied flow	2	R
4.	Differentiate afflux and backwater curve.	2	U
5.	What are the different types of energy dissipaters?	3	R
6.	List the assumptions made in the analysis of hydraulic jump using momentum equation.	3	R
7.	What is meant by breaking jet in a Pelton wheel turbine?	4	U
8.	Define specific speed of a turbine.	4	R
9.	Define manometric head.	5	R
10.	List out functions of air vessels in a reciprocating pump.	5	U

PART B - (5 X16 = 80 Marks)

11. (a) (i) A most economical trapezoidal section is required to give a maximum discharge of $20\text{m}^3/\text{s}$. The slope of channel bottom is 1 in 1500. Taking $C=70$ in Chezy's Equation, determine the dimensions of channel. **(10)** **1** **AP**
- (ii) Derive the relationship between the flow depth and width of a rectangular channel for a most economical section condition. **(6)** **1** **U**
- (OR)**
- (b) (i) A 8m wide channel conveys 15 cumecs of water at a depth of 1.2m. Determine Specific energy of flowing water, critical depth, critical velocity, minimum specific energy and state whether flow is sub critical or super critical. **(8)** **1** **AP**
- (ii) A rectangular channel which is laid on a bottom slope of 1 in 160 to carry a discharge of $20\text{ m}^3/\text{s}$ of water. Determine the width of channel when the flow is in critical condition. Take Manning's constant $n=0.014$. **(8)** **1** **AP**

12. (a) State and discuss the assumptions made in the derivation of dynamic equation for gradually varied flow. Derive the equation for the slope of the water surface in gradually varied flow with respect to
 (i) channel bed
 (ii) horizontal

(OR)

- (b) Explain briefly about the different types of water surface profiles. (16) 2 U
13. (a) (i) A rectangular channel 3 m wide is carrying 5.7 m³/s of water at a velocity 6.5 m/s discharges into a channel where a hydraulic jump is obtained. What is the height of the jump and Length of the jump. (10) 3 AP
- (ii) Explain briefly about types of surges with a neat sketch. (6) 3 U

(OR)

- (b) Show that the head loss in a hydraulic jump formed in a rectangular channel may be expressed as

$$E = \frac{(V_1 - V_2)^3}{2g(V_1 + V_2)}$$

14. (a) (i) Explain briefly about the working principle of Kaplan turbine with a neat sketch. (10) 4 U
- (ii) Write briefly about classification of turbines. (6) 4 U

(OR)

- (b) The following data is given for a Francis Turbine. Net head H=60m; Speed N=700 rpm; shaft power = 294.3kW; overall efficiency =93%; flow ratio=0.20; breadth ratio =0.1; Outer diameter of runner =2 x inner diameter of runner. The thickness of vanes occupy 5% of circumferential area of the runner, velocity of flow is constant at inlet and outlet and discharge is radial at outlet. Determine
 a) Guide blade angle
 b) Runner vane angles at inlet and outlet
 c) Diameters of runner at inlet and outlet and
 d) Width of wheel at inlet.

15. (a) Describe the principle and working of reciprocating pump with a neat sketch. (16) 5 U

(OR)

- (b) The internal and external diameter of the impeller of a centrifugal pump are 20cm and 40cm respectively. The pump is running at 1200rpm. The vane angles of the impeller at inlet and outlet are 20° and 30° respectively. The water enters the impeller radially and velocity of flow is constant. Determine the work done by the impeller per unit weight of water. (16) 5 AP