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Question Paper Code: 31415

B.E. / B.Tech. DEGREE EXAMINATION, NOVEMBER 2015

Fourth Semester

Civil Engineering

01UCE405 – APPLIED HYDRAULIC ENGINEERING

(Regulation 2013)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 2 = 20 Marks)

1. What is meant by displacement thickness?
2. List the minor energy losses.
3. Define the term "Hydraulic Jump".
4. Write the conditions for most economical circular section.
5. Define backwater curve and drawdown curve.
6. Give the classification of various surface profiles.
7. Define the term "Specific Speed" of the turbine.
8. State the functions of draft tube.
9. What is meant by cavitations?
10. What are the advantages of fitting air vessel in reciprocating pump?

PART - B (5 x 16 = 80 Marks)

11. (a) The difference in water surface level in two tanks, which are connected by three pipes in series of lengths 300*m*, 170*m* and 210*m* and of diameters 300*mm*, 200*mm*, and 400*mm* respectively is 12*m*. Determine the rate of flow of water if co-efficient of friction is 0.005, 0.0052 and 0.0048 respectively, considering: (i) minor losses also (ii) neglecting minor losses. (16)

Or

(b) Derive the expression for Hagen Poissuillie's equation. (16)

12. (a) (i) Find the slope of the bed of a rectangular channel of width 5 *m* when depth of water is 2 *m* and rate of flow is given as $20 m^3/s$. Take Chezy's constant, $C = 50$. (8)

(ii) The discharge of water through a rectangular channel of width 8 *m*, is $15 m^3/s$ when depth of flow of water is 1.2 *m*. Calculate:

(1) Specific energy of the flowing water

(2) Critical depth and critical velocity

(3) Value of minimum specific energy (8)

Or

(b) Derive the condition for most economical trapezoidal section of the channel. (16)

13. (a) (i) A rectangular channel 6 *m* wide has a bed slope of 1 in 2000 and under original conditions the depth is 1 *m*. A dam was placed across the channel, increasing the depth at the dam to 1.40 *m*. Calculate the depth of flow at 150 *m* upstream, assuming that the flow remains unchanged and *C* in Chezy formula remains constant at 60. (10)

(ii) State the assumptions made in gradually varied flow. (6)

Or

(b) Derive the equation for the height of a hydraulic jump with usual notations. (16)

14. (a) An inward reaction turbine has internal and external diameter as 1.0 *m* and 0.6 *m* respectively. The hydraulic efficiency of turbine is 90 *%* when the head on the turbine is 36 *m*. The velocity of flow at outlet is 2.5 *m/s* and discharge at outlet is radial. If the vane angle at outlet is 15^o and width of wheel is 1.00 *m* at inlet and outlet determine.

(i) The guide angle

(ii) Speed of turbine

(iii) Vane angle of runner of inlet power developed (16)

Or

(b) A Pelton wheel is to be designed for following specification

Shaft power = 11,722 *KW*

Head = 380 *m*

Speed = 750 *rpm*

Overall efficiency = 86 *%*

Jet diameters are not to exceed one sixth of wheel diameter. Determine

(i) Wheel diameter

(ii) The number of jets required

(iii) Diameter of jet, Take C_v = 0.985, Speed ratio = 0.45 (16)

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

Or

(b) A centrifugal pump having outer diameter equal to two times the inner diameter and running at 1000 *rpm* works against a total head of 40 *m*. The velocity of flow through the impeller is constant and equal to 2.5 *m/s*. The vanes are setback at an angle of 40^o at outlet. If the outer diameter of impeller is 500 *mm* and width at outlet is 50 *mm. D*etermine

(i) Vane angle at inlet

(ii) Work done by impeller

(iii) Monometric efficiency (16)