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Question Paper Code: 44105

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2018

Fourth Semester

Civil Engineering

14UCE405- APPLIED HYDRAULIC ENGINEERING

(Regulation 2014)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1. In open channel, the specific energy is

   (a) Energy per unit discharge
   (b) Total Energy measured below the datum
   (c) $h + V^2/2g$
   (d) Loss of energy

2. A open channel flow is one in which

   (a) The boundaries are closed at the top
   (b) The liquid flowing with free surface
   (c) Flow does not take place
   (d) Steady flow take place

3. A rectangular channel section will be most economical when the depth of flow and bottom width are in the ratio of

   (a) 1:4 (b) 1:1 (c) 1:2 (d) 2:1

4. In an open channel flow the discharge corresponding to the critical depth is

   (a) Maximum (b) Minimum (c) Zero (d) Average

5. The maximum increase in water level due to obstruction in the path of flow of water is called as

(a) hydraulic jump (b) gradually varied flow
(c) affux (d) surges

6. If the Froude number in open channel flow is more than 1.0, the flow is called

(a) critical flow (b) steaming flow
(c) shooting flow (d) none of the above

7. Cavitation in turbine causes

(a) Damage to blades (b) Noise and vibrations
(c) Fall in efficiency (d) All of the above

8. The specific speed of a Francis turbine is in the range of

(a) 10 to 35 (b) 35 to 60 (c) 60 to 140 (d) 3000 to 1200

9. The vertical height of the centre line of the centrifugal pump from the water surface in the pump is called as

(a) Suction head (b) Delivery head
(c) Manometric head (d) Static head

10. The rotating part of the centrifugal pump is

(a) Impeller (b) Casing (c) Suction pipe (d) Delivery pipe

PART - B (5 x 2 = 10 Marks)

11. Write about some minor losses.
12. Define critical depth.
13. State the assumptions involved in the analysis of gradually varied flow.
14. How will you classify the Turbines?
15. Define Slip.

PART - C (5 x 16 = 80 Marks)

16. (a) Find the displacement thickness, momentum thickness and energy thickness for a velocity distribution in the boundary given by $u/U = y/\delta$, where u is the velocity at a distance of y from the plate , $u = U$ at $y = \delta$, where δ is the boundary layer thickness. (16)

Or

(b) The difference in water surface levels in two tanks, which are connected by three pipes in series of lengths 300m, 170m and 210m and of diameters 300mm, 200mm and 400mm respectively, is 12m. Determine the rate of flow of water if co-efficient of friction are .005, .0052 and .0048 respectively, considering (i) minor loss (ii) neglecting minor loss. (16)

17. (a) A horizontal pipe of diameter 500mm is suddenly contracted to a diameter of 250mm. the pressure intensities in the large and the smaller pipe is given as 13.734N/cm^2 and 11.772N/cm^2 respectively. Find the loss of head due to contraction if C_c=0.62. Also determine the rate of flow of water. (16)

Or

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

(1) Specific energy of the flowing water

(2) Critical depth and critical velocity

(3) Value of minimum specific energy. (10)

(ii) The specific energy for a 3m wide channel is to be 3 *kg-m/kg*. What would be the maximum possible discharge? (6)

18. (a) State and discuss the assumptions made in the derivation of the dynamic equation for GVF. Starting from first principle, derive equation for the slope of the water surface in GVF with respect to (i) Channel bed, (ii) Horizontal. (16)

Or

(b) Define Hydraulic Jump. Derive the expression for depth of Hydraulic Jump. (16)

19. (a) A Pelton wheel is to be designed for a head of 60*m* when running at 200*rpm*. The Pelton wheel develops 95.6475*kW* shaft power. The velocity of the buckets is equal to 0.45 times the velocity of the jet, overall efficiency is equal to 0.85 and coefficient of velocity is equal to 0.98. (16)

Or

(b) An impulse wheel has a mean bucket speed of 10m/s with a jet of water flowing at the rate of 10 m^3/sec under a head of 50m. The bucket deflects the jet through an angle of 165°. Calculate the work done, power given by water to the runner and the hydraulic efficiency of the turbine. Assume Coefficient of velocity as 0.99. (16)

20. (a) A single acting reciprocating pump discharges 4.5 liters per second with cylinder bore diameter 200mm and stroke length 300mm. The pump runs at 350rpm and lifts water through a height of 25m. The delivery pipe is 30m long and 100 mm in diameter. Find the theoretical discharge and the theoretical power required to run the pump. Also determine the percentage slip. (16)

Or

(b) The outer diameter of an impeller of a centrifugal pump is 400 *mm* and outlet width 50 *mm*, the pump is running at 800 *r.p.m* and is working against a total head of 15 *m*. The vanes angle at outlet is 40^0 and manometric efficiency is 75%. Determine:

(i) Velocity of flow at outlet

(ii)Velocity of water leaving the vane, and

(iii) Angle made by the absolute velocity at outlet with the direction of motion at outlet. (16)

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