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Question Paper Code : 91227

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2014.

Fourth Semester

Civil Engineering

CE 2253/CE 44/CE 1253 A/080100020/10111 CE 404 — APPLIED HYDRAULICS
ENGINEERING

(Regulation 2008/2010)

(Common to PTCE 2253/10111 CE 404 – Applied Hydraulics Engineering for
B.E. (Part-Time) Fourth Semester – Civil Engineering – Regulation 2009/2010)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Differentiate between steady flow and uniform flow in an open channel.
2. Define specific energy.
3. Write the Bazin's formula for the discharge in the canal.
4. Define non-erodible channels.
5. Define transition depth.
6. Define energy dissipation.
7. When does the slip in a reciprocating pump become negative?
8. What is priming in centrifugal pump?
9. What is the purpose of providing a casing in turbine?
10. Define cavitation.

PART B — (5 × 16 = 80 marks)

11. (a) A trapezoidal channel having a cross sectional area A_1 , wetted perimeter P_1 , Manning's co-efficient ' n ' and laid to a slope S , base width b , carries a certain discharge Q_1 , at a depth of flow equal to ' d '. To increase the discharge, the base width of the channel is widened by ' x ', keeping all other parameters viz. S , d , side slope and n are same. Q_2 is the new discharge in the channel. Prove that,

$$(Q_2/Q_1)^3 (1 + (x/P_1))^2 = (1 + (xd/A_1))^5.$$

Or

- (b) Derive the geometrical properties of a most economical triangular channel section.
12. (a) Derive the Chezy's formula for discharge through channel. Write the formulae to find out the constant C .

Or

- (b) Show that the hydraulic radius is half of the flow depth for the most economic trapezoidal channel section.
13. (a) State and discuss the assumptions made in the derivation of the dynamic equation for gradually varied flow. Starting from first principle, derive equation for the slope of the water surface in gradually varied flow with respect to (i) channel bed, (ii) Horizontal.

Or

- (b) Define surges. What are its types? How the energy dissipated? Explain in detail.
14. (a) Illustrate with neat diagram the working principle and parts of the centrifugal pump.

Or

- (b) (i) A single acting reciprocating pump has a plunger diameter of 200 mm and stroke length of 320 mm. the speed of the pump is 50 rpm and the discharge is 0.035 cumecs of water. Determine :
(1) The theoretical discharge, (2) Co-efficient of discharge,
(3) Percentage of slip. (8)
- (ii) Explain in detail about the working of air vessel. (8)

15. (a) A Kaplan turbine runner is to be designed to develop 9100 kW. The net available head is 5.6 m. If the speed ratio = 2.09, flow ratio = 0.65, overall efficiency 86% and the diameter of the boss is $\frac{1}{3}$ the diameter of the runner. Find the diameter of the runner, its speed and the specific speed of the turbine.

Or

- (b) A Pelton wheel is required to develop 8575 kW when working under the head of 250 m. The speed of the Pelton wheel is 500 rpm. The co-efficient of velocity is 0.98 and the speed ratio is 0.46. Assuming jet ratio as 10 and overall efficiency as 82%. Determine :

- (i) The number of jets (6)
- (ii) The diameter of the wheel (6)
- (iii) The quantity of water required. (4)