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Question Paper Code : 71557

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2017.

Fourth Semester

Civil Engineering

CE 6403 — APPLIED HYDRAULIC ENGINEERING

(Regulations 2013)

Time : Three hours Maximum : 100 marks

(Tables/Charts to be permitted)

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Define specific energy.
2. Write the Bazin's formula for the discharge in the canal.
3. Define uniform and non-uniform flow in channels.
4. Write down the characteristics of GVF.
5. Write down the application of transition.
6. Define energy dissipation.
7. What is the purpose of providing a casing in turbine?
8. What is radial flow turbine?
9. What is an indicator diagram?
10. Why cavitation is considered as undesirable phenomenon in pump?

PART B — (5 × 13 = 65 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,

$$(Q_2 / Q_1)^3 \ (1 + (x / P_1))^2 = (1 + (x\,d / A_1))^5$$

Or

(b) Derive the geometrical properties of a most economical triangular channel section.

12. (a) State and discuss the assumptions made in the derivation of the dynamic equation for gradually varied flow. Starting from first principles, derive equations for the slope of the water surface in gradually varied flow with respect to

(i) channel bed,

(ii) horizontal.

Or

(b) Explain the features of water surface flow profile classifications.

13. (a) Define surge. What are its types? How the energy dissipated? Explain in detail.

Or

(b) Define hydraulic jump. What are its types? How the energy dissipated? Explain in detail.

14. (a) (i) Distinguish between impulse and reaction turbines. (7)

(ii) Define the following for a turbine : $(3 \times 2 = 6)$

(1) Manometric Efficiency

(2) Volumetric Efficiency

(3) Mechanical Efficiency.

Or

(b) A Kaplan turbine runner is to be designed to develop 8600 kW. The net available head is 6.6 m. If the speed ratio = 2.09, flow ratio = 0.60, overall efficiency 84% and the diameter of the boss is 1/3 the diameter of the runner. Find the diameter of the runner, its speed and the specific speed of the turbine.

15. (a) (i) List the factors involved in the selection of pump. (7)

(ii) Draw and explain the Muschel curves of pump. (6)

Or

(b) Explain with a neat sketch, the construction details and working principles of a reciprocating pump.

PART C — (1 × 15 = 15 marks)

16. (a) Write in detail about the application of hydraulic devices (any five). (5 × 3 = 15)

Or

(b) A Pelton wheel is required to develop 9530 kW when working under a head of 300 m. The speed of the Pelton wheel is 550 rpm. The co-efficient of velocity is 0.97 and the speed ratio is 0.48. Assuming jet ratio as 10 and overall efficiency as 85%. Design the following :

(i) The number of jets

(ii) The diameter of the wheel

(iii) The quantity of water required.