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

Fourth Semester

Civil Engineering

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

(Regulations 2008/2010)

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

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What are the different types of flow in open channel?

2. Define Specific Energy.

3. Write the Bazin's formula for the discharge in the canal.

4. Define non-erodible channels.

5. What are the uses of formation of hydraulic jump in a channel?

6. What is the cause of surge to occur in a flow?

7. What is an indicator diagram in a reciprocating pump?

8. Write a short note on slip and negative slip in reciprocating pump.

9. Write a short note on cavitation.

10. What are the functions of draft tubes?

PART B — (5 × 16 = 80 marks)

11. (a) (i) How are the flows classified under specific energy concepts? (6)

(ii) A 8 m wide channel conveys 15 cumecs of water at a depth of 1.2 m. Determine :

(1) Specific Energy of the flowing water

(2) Critical depth, critical velocity and minimum specific energy

(3) Froude Number and state whether the flow is subcritical or supercritical. (10)

Or

(b) (i) Explain the salient features of Specific Energy curve. (8)

(ii) Determine the critical depth for a specific energy of 1.5 m in the following channels :

(1) Rectangular channel

(2) Triangular channel

(3) Trapezoidal channel. (8)

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) A rectangular channel 8.5 m wide has a uniform depth of flow of 2.5 m and has a bed slope of 1 in 3000. If due to weir constructed at the downstream end of the channel, water surface at a section is raised by 0.8 m, determine the water surface slope with respect to horizontal at this section. Assume Manning's $n = 0.02$. (16)

Or

(b) 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. (16)

14. (a) (i) Derive an expression for the Euler's Head developed by a rotodyanamic hydraulic machine. (8)

(ii) What are the various applications of momentum principle? Explain. (8)

Or

(b) (i) What are the various types of turbines? Explain. (8)

(ii) What are the various types of draft tubes? Explain. (8)

15. (a) (i) A jet of water having a velocity of 40 m/s stikes a curved vane, which is moving with a velocity of 20 m/s. The jet makes an angle of 30° with the direction of motion of vane at inlet and leaves at an angle of 90° to the direction of motion of vane at outlet. Draw the velocity triangles at inlet and outlet and determine the vane angles at inlet and outlet so that the water enters and leaves the vane without shock. (12)

(ii) Derive the impulse momentum principle. (4)

Or

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

Power (brake or shaft)	–	9560 KW
Head	–	350 metres
Speed	–	750 r.p.m
Overall efficiency	–	85%
Jet diameter	–	not to exceed 1/6th of the wheel diameter

Determine the following :

(1) The wheel diameter,

(2) Diameter of the jet, and

(3) The number of jets required,

Take C = 0.985, Speed ratio = 0.45. (10)

(ii) Write down the difference between radial flow and axial flow turbine. (6)