

**L 1044**

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2006.

Fourth Semester

Civil Engineering

CE 1253 — APPLIED HYDRAULIC ENGINEERING

(Regulation 2004)

(Common to B.E (Part-Time) Third Semester)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What are the possible types of flow in open channel with respect to space and time?
2. What is the equation for critical depth for rectangular channel?
3. List the instruments used to measure velocity in an open channel.
4. Write the basic condition for most economical section for a trapezoidal section.
5. What is the classification of channel bottom slope which is used in flow profile computation?
6. What is back water curve in gradually varied flow profile flow profile and give practical example for getting this type of profile?
7. What is the condition for getting hydraulic jump in open channel?
8. Define specific force in open channel flow.
9. Write the equation for Specific speed for pumps and also for turbine.
10. Distinguish between Centrifugal pump and Reciprocating pump.

100

11. (i) How to estimate the length of hydraulic jump and draw sketch of the jump? (6)
- (ii) Derive the relation between conjugate depth  $y_1$  and  $y_2$  for a hydraulic jump occurred in rectangular channel. And also obtain the loss of energy in terms of conjugate depths due to hydraulic jump. (10)
12. (a) In a rectangular channel 3.5 m wide, flow depth of 2 m, find how high can be raised without causing afflux? If the upstream depth of flow raised to 2.5 m. What should be the height of the hump? Flow in the channel is  $26.67 \text{ m}^3/\text{s}$ ? (16)

Or

- (b) Calculate the critical depth and the corresponding specific energy for a discharge of  $5.0 \text{ m}^3/\text{s}$  in the following channel.
- (i) Rectangular channel of bed width 2.0 m. (5)
- (ii) Triangular channel of side slope 1 horizontal to 0.5 vertical. (5)
- (iii) Circular channel of diameter 2.0 m. (6)
13. (a) Define most economical section in open channel and obtain the relation for a trapezoidal channel. (16)

Or

- (b) (i) Define uniform flow and draw the hydraulic gradient line, Total Energy line and water surface for uniform flow. (5)
- (ii) A concrete lined trapezoidal channel ( $n = 0.015$ ) is to have a side slope of 1 horizontal to 1 vertical. The bottom slope is to be 0.0004. Find the bottom width of the channel necessary to carry  $100 \text{ m}^3/\text{s}$  of discharge at a normal depth of 2.5 m. (11)
14. (a) Derive the dynamic equation of gradually varied flow in an open channel and also state the methods of estimating the flow profile. (16)

Or

- (b) A river 100 m wide and 3 m depth has an average bed slope of 0.0005. Estimate the length of the gradually varied flow profile between 4.5 m to 4 m depth of flow. This back water profile produced by a low weir which raises the water surface just upstream of it by 1.5 m from normal depth. Assume  $n = 0.035$ .

15. (a) (i) What is bucket speed of a Pelton wheel turbine? (3)

(ii) A Pelton wheel has a mean bucket speed of 10 m/s with a jet of water flowing at the rate of  $0.7 \text{ m}^3/\text{s}$  under a head of 30 m. The buckets deflects the jet through an angle of 160 degree. Calculate the power given by water to the runner and the hydraulic efficiency of the turbine. Assume coefficient of velocity as 0.98. (10)

Or

(b) (i) What is specific speed of a pump and what is its importance? (3)

(ii) The cylinder bore diameter of a single acting reciprocating pump is 150 mm. and its stroke length is 300 mm. The pump runs at 50 rpm and lifts water through a height of 25 m. The delivery pipe is 22 m long and 100 mm. in diameter. Find the theoretical discharge and the theoretical power required to run the pump. If the actual discharge is 4.2 litres/s, find the percentage slip. (13)

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