

B. E / B. Tech. (Full Time) DEGREE END SEMESTER EXAMINATIONS NOV/DEC 2011

CIVIL ENGINEERING BRANCH

FOURTH SEMESTER

CE 283 APPLIED HYDRAULIC ENGINEERING
(REGULATION 2004)

TIME: 3 hr

Max Mark: 100

Answer ALL questions

PART – A (10 x 2 = 20 MARKS)

1. When a channel is said to be an exponential channel?
2. State the conditions for a trapezoidal channel to be called a most economical channel.
3. Under which circumstances the NDL and CDL are at the same depth?
4. List the assumptions involved in deriving the dynamic equations of GVF
5. At the toe of a hydraulic jump the Froude number and the depth of flow are 10.0m and 0.4 m respectively. Estimate the sequent depth and Energy loss.
6. What is meant by positive surge?
7. Differentiate impulse and reaction turbines and give examples.
8. Draw the inlet and outlet velocity triangles for centrifugal pump.
9. What is meant by ideal indicator diagram?
10. A double acting reciprocating pump having piston area 0.1m^2 has a stroke of 0.3 m long. The pump is discharging 2.4 m^3 of water per minute at 45 rpm through a height of 10m. Find the slip of the pump.

PART – B (5 x 16 = 80 Marks)

11. a. i A triangular channel has a side slope of 1.5 H:1V and is laid on a longitudinal slope of 1 in 1650. Assuming Manning's $n = 0.013$, estimate the normal depth required to pass a discharge of $0.30\text{ m}^3/\text{s}$ (8)
- a. ii Obtain an expression for the depth of flow in a circular channel which gives maximum discharge for a given longitudinal slope and constant value of Manning's 'n' and constant value of Chezy's 'C' (8)
12. a. i With the help of a diagram discuss the surface profile variations in a mild and steep sloped channels considering the given depth lies in all the zones of the respective channels. (16)

OR

12. b.i A rectangular channel has a bed width of 4 m, bottom slope of 0.0004 and Manning's n as 0.02. The normal depth of flow in this channel is 2.0 m. If the channel empties into a pool at the downstream end and the pool elevation is 0.60m higher than

the canal bed elevation at the downstream end, calculate the coordinates of the resulting GVF profile. (16)

- 13 a.i Derive an expression for estimation of sequent depths of a hydraulic jump and also list the applications of hydraulic jump (10)
- a.ii Discuss the various types of hydraulic jump with a neat diagrams (6)

OR

13. b.i A trapezoidal channel having bottom width 8m and side slope 1:1 carries a discharge of $80 \text{ m}^3/\text{s}$. Find the depth conjugate to initial depth of 0.75m before the jump. Also determine the loss of energy in the jump (16)

14. a. i A Pelton wheel has to develop 18,000 bhp under a net head of 800m while running at a speed of 600 rpm. If the coefficient of the jet $C_v = 0.97$, speed ratio $= 0.46$ and the ratio of the jet diameter is $1/16$ of the wheel diameter, calculate the number of jets required for the pelton wheel. Calculate also the diameter of jets, the pitch diameter and the quantity of water supplied to the wheel. Assume overall efficiency as 85% (16)

OR

14. b. i Write short notes on the characteristic curves of centrifugal pump (4)
- b ii A centrifugal pump is running at 1000 rpm. The outlet vane angle of the impeller is 45 degree and the velocity of flow at outlet is 2.5m/s. The discharge through the pump is 200 lps when the pump is working against a head of 20m. If the manometric efficiency of the pump is 80% determine the diameter of the impeller and the width of the impeller at outlet. (12)

15. a. i A single acting reciprocating pump running at 60 rpm, has a plunger diameter of 0.25m and stroke length of 0.5m. The delivery pipe is 0.1m diameter and 50m long. If the motion of the piston is simple harmonic, find the power required to overcome friction of the delivery pipe, when (a) no air vessel is fitted (b) a large air vessel is fitted at the centre line of the pump (16)

OR

15. b.i Derive an expression for pressure head due to acceleration of the piston of a reciprocating pump, assuming motion of the piston to be SHM (16)