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B.E (Full Time) DEGREE END SEMESTER EXAMINATIONS, APR/MAY 2014
CIVIL ENGINEERING BRANCH (ENGLISH & TAMIL)
FOURTH SEMESTER – (REGULATION 2012)
CE 8401 APPLIED HYDRAULIC ENGINEERING

Time : 3 hr

Max Mark : 100

Part-A (10 x 2 = 20 Mark)

Answer All Questions

1. Define the most economical channel and write the condition for rectangular channel.
2. Enlist the characteristics of a critical flow in an open channel.
3. State the assumption made in deriving dynamic equation of GVF.
4. Draw the GVF profile for change in grade from mild to steep slope.
5. Classify the hydraulic jump based on Froude number.
6. Differentiate between positive surge and negative surge.
7. What is the use of breaking jet in Pelton wheel turbine?
8. What is NPSH in centrifugal pumps?
9. Define negative slip and when it will occur in reciprocating pump?
10. Is gear pump a positive displacement pump? – Justify.

Part-B (5 x 16 = 80 Mark)

(Question number 11 is compulsory)

11. (a) A double acting reciprocating pump has piston of diameter 250 mm and piston rod of diameter 50 mm which is on one side only. Length of piston stroke is 350 mm and speed of crank moving the piston is 60 r.p.m. The suction and delivery heads are 4.5 m and 18 m respectively. Determine the discharge capacity of the pump and the power required to operate the pump. (10)
11. (b) Draw the indicator diagram with the effect of acceleration and friction in suction and delivery pipes. (6)
12. (a) An irrigation channel of trapezoidal cross section, having side slopes 1.5H: 1V is to carry a flow of $10 \text{ m}^3/\text{s}$ on a bed slope of 1 in 5000. The channel is to be lined for which the Manning's roughness coefficient $n = 0.012$. Find the dimensions of the most economic cross section of the channel. (16)

(OR)

(P.T.O)

12. (b) A discharge of $15 \text{ m}^3/\text{s}$ flows through a rectangular channel 3 m wide. The depth of flow is 2 m. A smooth hump of 0.1 m is built at a section. Also, the bottom width is reduced to 2.8 m. What is the depth of flow at the contracted section? Neglect the frictional losses. (16)

13. (a) A wide rectangular channel has a longitudinal slope of 0.008 and a discharge of $10 \text{ m}^3/\text{s}/\text{m}$ width. If Manning's roughness coefficient $n = 0.02$, determine whether the channel slope is mild or steep. For what range of depths will the flow be on a type 1, 2 and 3 curve. (16)

(OR)

13. (b) At a certain section A in rectangular channel of bed width 2 m the depth of flow is 1.2 m. When the flow rate is $6 \text{ m}^3/\text{s}$, estimate the distance from A to another section B where the depth is 1.4 m. The bed slope is 0.002 and Manning's $n = 0.015$. Use direct step method for GVF profile. (16)

14. (a) Water is being discharged from a sluice gate at a rate of $18 \text{ m}^3/\text{s}$ in a 3 m wide rectangular channel. A hydraulic jump is found to occur at a section where the depth of flow is 0.5 m. Determine the (i) depth after the jump and (ii) total power dissipated in the jump. (16)

(OR)

14. (b) In a hydraulic jump on a horizontal rectangular channel the depth and Froude number before the jump are 0.2 m and 9 respectively. Estimate the energy loss and specific energy at the end of the jump. Also, determine the percentage of initial energy loss in this jump. (16)

15. (a) A inward flow Francis turbine works at 450 r.p.m. under a head of 115 m. The diameter of the inlet is 1.2m and the flow area is 0.4 m^2 . At the inlet the absolute and relative velocities make angles of 20° and 60° respectively with the tangential velocity. Determine the power developed and hydraulic efficiency of the turbine. (16)

(OR)

15. (b) A Kaplan turbine develops 15MW power at a head of 30 m. The diameter of the boss is 0.35 times the diameter of the runner. Assuming the speed ratio of 2, flow ratio of 0.65 and an over all efficiency of 95%, determine the diameter of the runner, rotational speed and specific speed of this turbine. (16)
