

30.4.19

B.E. (Full Time) DEGREE END SEMESTER EXAMINATIONS, APRIL 2019  
Common to Civil Engineering (Tamil and English)  
FOURTH SEMESTER - (REGULATION 2012)  
CE 8401 APPLIED HYDRAULICS ENGINEERING

Time: 3 hours

Max. Marks: 100

Answer ALL questions

Part - A

(10 x 2 = 20 Marks)

1. Define alternate depth in an open channel flow.
2. Write the equation for the flow velocity in an open channel.
3. Write the equation for standard step method to find water surface profile.
4. Distinguish between direct step method and standard step method.
5. What is meant by energy loss due to hydraulic jump?
6. When a regulator operates suddenly in an open channel causes positive surges. Give suitable example.
7. Draw a sketch of absolute and relative velocity in a centrifugal pump impeller.
8. What is the Euler's equation for whirl in a hydraulic turbine?
9. Under what circumstances rotary pumps used in lifting liquid?
10. Draw a sketch of the parts of reciprocating pump.



Part - B

(5 X 16 = 80 Marks)

11. a) A single acting reciprocating pump cylinder diameter 300 mm, stroke length 40cm. Speed 60 rpm discharges 16.5 litres per second. The suction head 5 m. and delivery head 15 m. Determine theoretical discharge, the percentage slip and power required to run the pump. (16)
12. a) A trapezoidal open channel bottom width 3.0 m, two slant side slope 1.5 horizontal: 1 vertical and having bed slope 0.005. Flow depth in the open channel is 1.4m. Assume Manning's roughness coefficient  $n=0.018$ . Determine the velocity and discharge through the open channel. (16)

Reg. No	2	0	1	6	1	5	1	0	3
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(OR)

12. b) A 5.0 m bottom width rectangular open channel carries discharge of  $18.0 \text{ m}^3/\text{s}$  at a depth of 2.0m. Determine the specific energy, critical depth and critical velocity in the channel. (16)

13 a) An open channel trapezoidal cross section of bottom width 4.0 m and side slopes 2 horizontal: 1 vertical having bed slope 0.002. The discharge through the channel is  $3.0 \text{ m}^3/\text{s}$ . Determine whether the channel slope is mild or steep. Assume Manning's roughness coefficient  $n=0.017$ . (16)

(OR)

13 b) Derive from basic principle the gradually varied flow profile dynamic equation in an open channel and also state assumption made for deriving the equation. (16)

14. a) Define surge in an open channel and Explain the classification of surges with its respective equation. (16)

(OR)

14. b) For a hydraulic jump in a rectangular channel the velocity and depth after the jump are known to be 2.5 m/s and 1.7 m respectively. Calculate the depth before the jump and the energy loss dissipated per metre width (16)

15. a) Prove that the hydraulic efficiency of the Pelton wheel is maximum when the ratio between vane velocity and water jet velocity is half (ratio 1/2). Also derive the maximum efficiency equation. (16)

(OR)

15. b) A centrifugal pump speed 1000 rpm with its outer blade angle  $30^\circ$ . The outlet velocity 3.0 m/s. The pump lifts to a total head of 30 m with a discharge of  $0.3 \text{ m}^3/\text{s}$ . The hydraulic efficiency 75%. Determine the outer diameter and outer width of the impeller. (16)

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