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**Question Paper Code: 54106**

B.E. / B.Tech. DEGREE EXAMINATION, MAY 2018

Fourth Semester

Civil Engineering

15UCE406 APPLIED HYDRAULIC ENGINEERING

(Regulation 2015)

Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions

PART A - (5 x 1 = 5Marks)

1. In open channel flow the discharge corresponding to critical depth is CO1- R  
(a) minimum                      (b) maximum                      (c) zero                      (d) average
  
2. A rectangular channel section will be most economical when the CO2- R  
depth of flow and bottom width are in the ratio of  
(a) 1:4                      (b) 1:1                      (c) 1:2                      (d) 2:1
  
3. The type of jump that forms when the Froude number lies between CO3- R  
2.5 and 4.5 is  
(a) weak jump                      (b) steady jump                      (c) undular jump                      (d) oscillating jump
  
4. Cavitation in turbine causes CO4- R  
(a) damage to blades                      (b) noises and vibration  
(c) fall in efficiency                      (d) all the above
  
5. Priming is not required in CO5- R  
(a) reciprocating pump                      (b) centrifugal pump  
(c) dynamic pressure pump                      (d) hand pump

PART – B (5 x 3= 15Marks)

6. Discuss the equipments used to measure the velocity distribution in a open channel CO1-U
7. What do you meant by most economical section of a open channel? CO2- R
8. What is the nature of slope of the channel if critical depth line occurs above the normal depth line? CO3- R
9. What is the purpose of providing a casing in turbine? CO4- R
10. Why are the centrifugal pumps connected in parallel? CO5- R

PART – C (5 x 16= 80Marks)

11. (a) Water flows at rate of 20cumecs in a rectangular channel 14m wide at a velocity of 1.8m/s. Determine the specific energy of the flowing water, critical velocity and minimum specific energy corresponding to this discharge, the Froude number and state whether the flow is subcritical or super critical. CO1- App (16)

Or

- (b) (i) Explain with neat sketches about different types of open channel flow. CO1- App (6)
- (ii) The discharge of water through a rectangular channel of width 7m, is  $16\text{m}^3/\text{sec}$  when the depth of flow of water is 1.2m, calculate CO1- App (10)
  - (i) specific energy of the flowing water
  - (ii) critical depth and critical velocity and
  - (iii) value of minimum specific energy

12. (a) (i) Show that the hydraulic radius is half of the flow depth for the most economical trapezoidal channel section CO2- App (6)
- (ii) Derive Chezy's and mannings formula for discharge through channel. CO2- App (10)

Or

- (b) Prove that  $y_c^3 = (2y_1^2 + y_2^2) / (y_1 + y_2)$  for flow in a rectangular channels.  $y_c$  is critical depth and  $y_1$  &  $y_2$  are alternate depth. CO2- Ana (16)

13. (a) In a hydraulic jump occurring in a rectangular channel of 4m width, the discharge is  $8.76 \text{ m}^3/\text{s}$  and the depth before the jump is 0.3. Estimate  
 (i) Sequent depth  
 (ii) Energy loss in the jump CO3- Ana (16)
- Or
- (b) A river 50m wide and 4m deep has natural bed and surface of slope 1 in 10000. Compute the approximate length of the backwater curve produced by an afflux of 3m. Take  $N=0.03$  CO3- App (16)
14. (a) Illustrate with neat diagram, the working principle and components of a Kaplan turbine CO4 -U (16)
- Or
- (b) A turbine is to operate under a head of 25m at 200rpm. If the discharge is  $9 \text{ m}^3/\text{sec}$  and turbine efficiency is 90%, calculate power generated by the turbine, specific speed of the turbine and performance of the turbine under the head of 20m. Also state the type of turbine. CO4- App (16)
15. (a) The centrifugal pump has the following characteristics. Outer diameter of the impeller =800mm, width of the impeller vanes at outlet=100mm, angle of impeller vanes at outlet=40°. The impeller runs at 550rpm and delivers  $0.98 \text{ m}^3/\text{sec}$  under an effective head of 35m. A 500 kW motor is used to drive the pump. Determine the manometric, mechanical and overall efficiencies of the pump. Assume that water enters the impeller vanes radially at inlet. CO5- App (16)
- Or
- (b) Explain with neat sketch, the construction details and working principles of a reciprocating pump. CO5-U (16)

