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Question Paper Code: 54106

B.E. / B.Tech. DEGREE EXAMINATION, MAY 2022

Fourth Semester

Civil Engineering

15UCE406- APPLIED HYDRAULIC ENGINEERING

(Regulation 2015)

Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions

PART A - (5 x 1 = 5 Marks)

1. Most economical section of a triangular channel, is CO1-R
(a) Equilateral triangle (b) Right angled triangle
(c) Isosceles triangle with 45° vertex angle (d) Right angled triangle with equal sides.
2. The flow in open channel is said to be subcritical if the Froude number is CO2-R
(a) Less than 1.0 (b) Equal to 1.0 (c) Greater than 1.0 (d) None.
3. Highest dam in India, is CO3-R
(a) Bhakra dam (b) Hirakund dam (c) Nagarjuna Sagar dam (d) Iddiki dam.
4. A turbine is called pelton wheel turbine if at the inlet of the turbine the CO4-R
total energy is.....
(a) kinetic energy only (b) kinetic energy and pressure energy
(c) pressure energy only (d) none of the above
5. Operation of reciprocating motion is done by a _____ source CO5-R
(a) Power (b) Energy (c) Momentum (d) Inertia

PART – B (5 x 3= 15Marks)

6. Define open channel flow and state various types of flow CO1-R
7. What is meant by most economical section? CO2-R
8. What is Control Section and Transition Depth CO3-R
9. Define draft tube? State its types and uses? CO4-R

10. Define slip & negative slip.

CO5-R

PART – C (5 x 16= 80Marks)

11. (a) (i) If y_1 and y_2 are the alternate depths in a rectangular channel show that $(2y_1^2 + y_2^2) / (y_1 + y_2) = y_c^3$. And hence the specific energy,

$E = (y_1^2 + y_1 y_2 + y_2^2) / (y_1 + y_2)$, Explain supercritical flow in width constriction

(ii) Explain in details the various types and regime of flow CO1-App (8)

Or

(b) (i) Explain with a neat sketch the salient features of Specific Energy Curve CO1-App (8)

(ii) A 8m wide channel conveys 15 cumecs of water at a depth of 1.2m. CO1-App (8)

Determine

(a) Specific Energy of the flowing water,

(b) Critical Depth, Critical Velocity and Minimum Specific Energy,

(c) Froude Number and

(d) state whether the flow is subcritical or super critical

12. (a) (i) The bed width of a trapezoidal channel section is 40m and the side slope is 2 horizontal to 1 vertical. The discharge in the canal is 60 cumecs. The Mannings 'n' is 0.015 and bed slope is 1 in 5000. Determine the normal depth. CO2-App (8)

(ii) Derive the chezy's formula for discharge through channel. CO2-App (8)
Write the Formulae to find out the constant C.

Or

(b) An open channel of most economical section having the form of a half hexagon with horizontal bottom is required to give maximum discharge of 20.3 m³/s of water. The slope of the channel bottom is 1 in 2500. Take C = 60, find the cross-section. CO2-Ana (16)

13. (a) A rectangular channel 5m wide carries a discharge of $15 \text{ m}^3/\text{sec}$. It is laid at a slope of 0.0001. If at a section in this channel the depth is 1.6m, how far(upstream or downstream) from the section will the depth be 2.0m? Take Manning's N as 0.015. Used Direct Step Method CO3-Ana (16)

Or

- (b) (i) A river 100m wide and 3m deep has stable bed and vertical banks with a bed slope of 1 in 2500. Estimate length of backwater curve produced by afflux of 2m. Mannings N 0.035 CO3-Ana (8)
- (ii) Derive an expression for Loss of head in Hydraulic Jump CO3-Ana (8)
14. (a) A Pelton wheel is to be designed: Shaft power 11,772 kW, Head 380m; Speed 750 RPM; Overall Efficiency 80%; Jet diameter is not to exceed 1/6 of wheel diameter. CO4-Ana (16)

Find

- (i) Wheel Diameter,
(ii) No of jets,
(iii) Diameter of jet.

Assume $C_v = 0.985$ and speed ratio = 0.45

Or

- (b) (i) What are characteristic curves in turbine? List the types.Explain in detail with neat sketch CO4-Ana (10)
- (ii) Write short notes on cavitations in turbines. CO4-Ana (6)
15. (a) A cylinder bore diameter of a single acting reciprocating pump is 150 mm and its stroke length is 350mm. The pump runs at 60 rpm and lifts water through 25 m. The delivery pipe is 22m long and 100mm diameter. Find the theoretical discharge and power of the pump. If the actual discharge is 4.2 LPS, Find the Slip and percentage slip. Also determine the acceleration head at the beginning, middle and end of delivery stroke. CO5-Ana (16)

Or

- (b) The external and internal diameter of the impeller of centrifugal pump are 0.6 m and 0.3 m respectively and the width of impeller at outlet is 60 mm. The speed of the pump is 1440 rpm and it is required to work against the head of 105 m. The velocity of flow through the impeller is maintained at 4 m/s. The exit vane angle is 130° . Determine the vane angle at inlet, workdone by impeller on water per second and the manometric efficiency of the pump. CO5-Ana (16)