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Question Paper Code: 94106

B.E. / B.Tech. DEGREE EXAMINATION, APRIL 2024

Fourth Semester

Civil Engineering

19UCE406 - APPLIED HYDRAULIC ENGINEERING

(Regulations 2019)

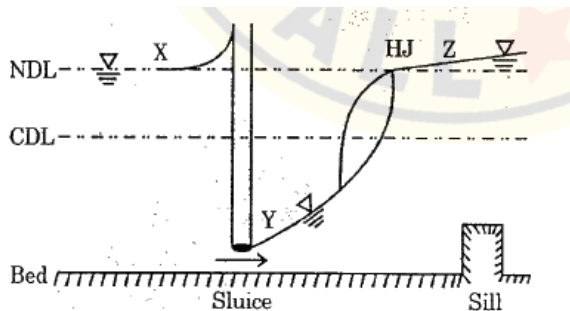
Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions

PART A - (5 x 1 = 5 Marks)

1. An open channel carries water with a velocity of 0.605m/s. If the average bed shear stress is 1.0 N/m^2 The chezy coefficient C is equal to CO2- App
(a) 500 (b) 60 (c) 6 (d) 30
2. A sluice gate opening in a canal is shown in the fig. Identify the shape of water surface profiles at X, Y and Z will be respectively. (NDL = Normal Depth Line, CDL – Critical Depth Line, HJ = Hydraulic Jump) CO3-Ana



- (a) M1,M3, and M1 (b) M2.M3 and M2 (c) S1,S3and S2 (d) H2.S3 and S1
3. Hydraulic jump is used for..... CO1-U
(a) increasing the depth of flow (b) reducing the energy of flow
(c) decreasing the velocity of flow (d) reducing turbulence
4. Inlet velocity triangle for Pelton Wheel is CO1-U
(a) Right angle Triangle (b) Equilateral Triangle
(c) Straight line (d) None of the above

5. For low head and low discharge, the suitable pump is CO1-U
- (a) Centrifugal Pump (b) Reciprocating pump
- (c) Gear oil Pump (d) Submersible Pump

PART – B (5 x 3= 15 Marks)

6. What is meant by most economical section? CO1- U
7. What is a drawdown curve and backwater curve? CO1- U
8. Enumerate the classification of hydraulics jumps. CO1- U
9. What are reaction turbines? Give example. CO1- U
10. Define slip of reciprocating pump. When does negative slip occurs? CO1- U

PART – C (5 x 16= 80 Marks)

11. (a) Find the discharge through the most economical trapezoidal channel has side slope of 1 horizontal to 2 vertical and the slope of the bed is 1 in 1500. The area of the section is 40m^2 . Find the dimension of the section. if $C = 50$ CO2- App (16)
- Or
- (b) Find the discharge through the trapezoidal channel of width 8 m and side slope of 1 horizontal to 2 vertical. The depth of flow of water is 2.4 m and the value of Chezy's constant $C = 50$. The slope of the bed of the channel is given by 1 in 4000. CO2- App (16)
12. (a) Analyze the differential Dynamic equation of gradually varied flow by made in the assumptions. CO3- Ana (16)
- Or
- (b) Find the whether the second section is located downstream or upstream with respect to the first section. The normal depth of flow of , in a rectangular channel 2m wide ,is 1.2m. The bed slope of the channel is 0.0006 and manning's roughness coefficient $n=0.015$. Find the critical depth .At a certain section of the same channel the depth is 0.90 while at a second section the depth is 0.85. Find the distance b/w two sections. CO3- Ana (16)
13. (a) The depth of flow of water at a certain section of a rectangular section 2m wide is 0.25m. The discharge through the channel is $1.8\text{m}^3/\text{sec}$. Determine whether a hydraulic jump will occur and if so, determine its height and loss of energy per Kg of water. CO2- App (16)

Or

- (b) A spillway discharges a flood flow at a rate of 7.75 cumecs /m width. At the downstream horizontal apron the depth of flow was found to be 0.5 m. What tail water depth is needed to form a hydraulic jump? If a jump is formed, examine its type, length, head loss and energy loss as a percentage of the initial energy. CO2- App (16)
14. (a) A Pelton wheel is to be designed for the following specifications. Power = 735.75 kW S.P. Head = 200m, Speed = 800 r.p.m. $\eta_0 = 0.86$ and jet diameter is not to exceed one-tenth the wheel diameter. Determine
 i). Wheel diameter ii). The number of jets required and iii). Diameter of the jet. Take $C_v = 0.98$ and speed ratio = 0.45 CO4-App (16)
- Or
- (b) A Kaplan turbine is to be designed to develop 9000KW .The net available head is 5.6m.The speed ratio is 2.09 and the flow is 0.68.The overall efficiency is 86% and diameter of the boss is one - third the diameter of the runner .Determine the diameter of the runner, speed, and specific speed of the turbine. CO4- App (16)
15. (a) A single acting reciprocating pump running at 50 rpm delivers water at a rate of 0.01m³ /sec. The diameter of the piston (D) is 200mm and stroke length L=400mm. Determine Theoretical discharge of the pump, Coefficient of discharge, slip and % slip of the pump and power required to drive the pump if $h_s=25\text{m}$ and $h_d=30\text{m}$. CO4- App (16)
- Or
- (b) A centrifugal pump having outer diameter equal to two times the inner diameter and running at 1000 rpm works against a total head of 40 m. The velocity of flow through the impeller is constant and equal to 2.5 m/s. The vanes are set back at an angle of 40 degrees at outlet. If the outer diameter of the impeller is 500 mm and width at outlet is 50 mm. List the following CO4- App (16)
- (i) Vane angle at inlet
 (ii) Work done by impeller on water per second
 (iii) Manometric efficiency.

