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Question Paper Code: 94106

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2023

Fourth Semester

Civil Engineering

19UCE406 - APPLIED HYDRAULIC ENGINEERING

(Regulations 2019)

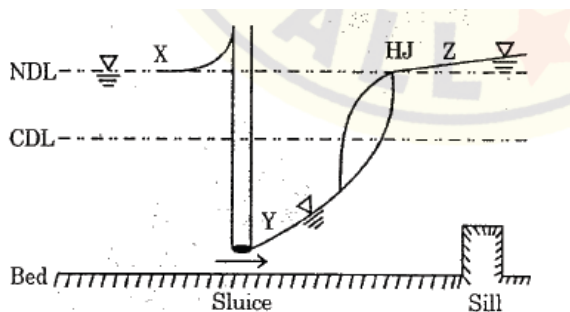
Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions

PART A - (5 x 1 = 5 Marks)

1. A rectangular open channel carries a discharge of $15 \text{ m}^3/\text{s}$ when the depth of flow is 1.5 m and the bed slope is 1: 1440. What will be the discharge through the channel at the same depth if the slope would have been 1:1000? CO2- App
a) $21.6 \text{ m}^3/\text{s}$ b) $18 \text{ m}^3/\text{s}$ c) $14.4 \text{ m}^3/\text{s}$ d) $12.5 \text{ m}^3/\text{s}$
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, S3 and 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. A hydraulic machine which converts Mechanical energy into Hydraulic energy is called as CO1-U
- (a) Pump (b) Turbine (c) Rotor (d) Runner

PART – B (5 x 3= 15 Marks)

6. Define Specific Energy with neat sketch CO1- U
7. What is a drawdown curve and backwater curve? CO1- U
8. Define impulse momentum principle. CO1- U
9. What are reaction turbines? Give example. CO1- U
10. Define Priming of pump. 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) The discharge of water through a rectangular channel of width 8 m, is $15\text{ m}^3/\text{s}$, when depth of flow of water is 1.2m. Calculate CO2- App (16)
- i) Specific energy of the flowing water
- ii) Critical Depth and Critical Velocity
- iii) Value of minimum specific energy
12. (a) Find differential Dynamic equation of gradually varied flow by applying the suitable assumptions CO2- App (16)
- Or
- (b) 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. Also find the whether the second section is located downstream or upstream with respect to the first section. CO2- App (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 Double acting reciprocating pump running at 40 rpm delivers 1 m³/sec water. The pump has a stroke length of 400mm and diameter of the plunger is 200 mm. The delivery and suction head are 20 m and 5 m respectively. Determine the theoretical discharge, slip, percentage slip, coefficient of discharge and the power required to derive the pump. CO4- App (16)
- Or
- (b) In an industry, it is expected to transfer high pressure liquid from chamber to another in high velocity. Suggest a suitable pump system and discuss about its principles, working with neat sketch. CO4- App (16)

