01 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2073 Bhadra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BCE, B. Agri.	Pass Marks	32
Year / Part	II / II	Time	3 hrs.

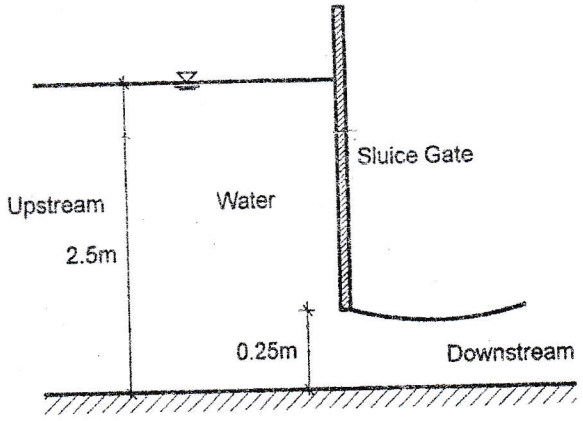
Subject: - Hydraulics *(CE555)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. In a hydro dynamically rough pipe of 100 mm diameter, the ratio of velocities at 10 mm and 30 mm from the pipe wall is 0.838. Determine the average height of the wall roughness, shear stress at the wall and mean velocity of flow if velocity at 30 mm is 1.90 m/s. [8]
2. A single uniform pipe joins two reservoirs. Calculate the percentage increase of flow rate obtainable if, from the mid-point of this pipe, another of the same diameter is added in parallel to it. Assume equal friction factor for both pipes and neglect minor losses. [8]
3. A reservoir A feeds two lower reservoirs B and C through a single pipe 10 km long, 750 mm diameter having a downward slope of 2.2×10^{-3}. This pipe then divides into two branch pipes, one 5.5 km long laid with a downward slope of 2.75×10^{-3} (going to B), the other 3 km long having a downward slope of 3.2×10^{-3} (going to C). Calculate the necessary diameters of the branch pipes so that the steady flow rate in each shall be 0.24 m^3/s, when the level in each reservoir is 3 m above the end of the corresponding pipe. Neglect all losses except pipe friction and take f = 0.025 throughout. [10]
4. Discuss Water hammet phenomenon. Develop Euler's equation as well as continuity equation for unsteady flow. [8]
5. Define steady Non uniform and spatially varied flow. Give at least two examples of each flows. [3]
6. a) Design an economical trapezoidal channel with a velocity of 0.6 m/s. The side slope Z of cannel is 1.5 and conveys a discharge of 3 m^3/s. Take manning's coefficient as 0.003. Also find the required bed slope. [6]

   b) Define hydraulic exponent. Show that the value of hydraulic exponent for rectangular section is equal to 10/3. [4]
7. a) Water flows in a 4 m wide rectangular channel at a depth of 1.8 m and velocity 1.4m/s. The channel is contracted to a width of 1.25m in particular reach. Is the flow possible in given specific energy? If not, what should be the discharge in channel so that flow is possible in the given specific energy? Also determine the depth of flow at contracted section and upstream of contracted section. [2+2+3]

b) Figure shows flow through the sluice gate provided in a rectangular channel of width 10 m. If the discharge in the channel is $7m^3/s$, determine the force exerted by water in the gate. Take momentum correction factor equals to 1.15. [5]

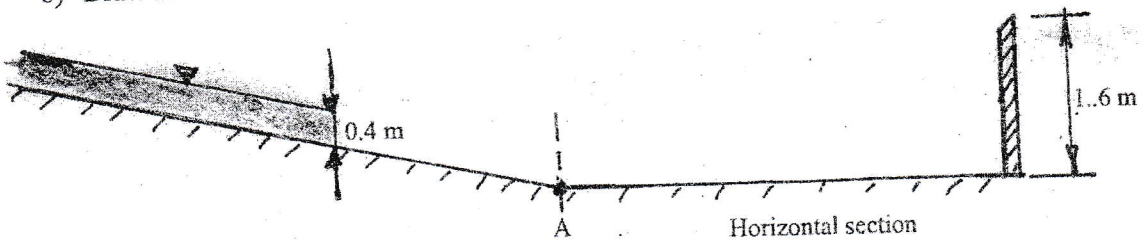


8. What is a mild slope? Justify analytically the nature of surface profiles (both upstream and downstream end) for mild slope. [1+4]

9. The partial water surface profile shown in figure below is for a rectangular channel of 3 m width in which water is flowing at a discharge of $5m^3/sec$.

   a) Does a hydraulic occur in a channel? If so, is it located upstream on downstream at point A? [5]

   b) Draw and name water surface profile. [5]



10. Why shear stress reduction factor "K" is necessary while designing the mobile boundary channel? Explain the design procedures (step by step) of mobile boundary channel by maximum permissible velocity approach. [2+4]

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