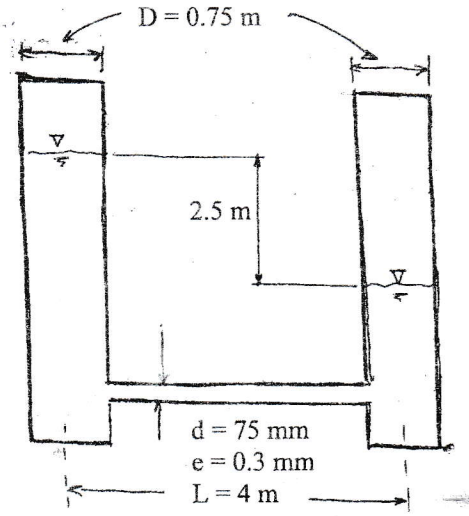
06 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2072 Magh

Exam.	New Back (2066 & Later Batch)		
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**.*
- ✓ ***Necessary figures are attached herewith.***
- ✓ *Assume suitable data if necessary.*

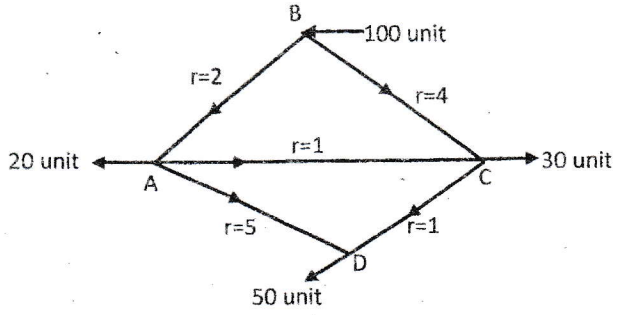
1. Water flows by gravity in two open stand pipes shown in figure. Estimate the rate of change of water level in left standpipe. [8]



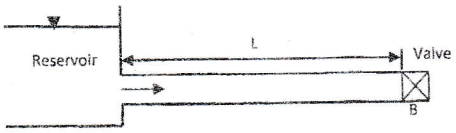
2. Water from a main canal is siphoned to a branch canal over an embankment by means of a wrought iron pipe of 100 mm diameter. The length of the pipeline up to the summit is 30 m and the total length is 90 m. Water surface elevation in the branch canal is 10 m below that of main canal. Take f = 0.025 and consider all losses. [4+4]
   a) If the total quantity of water required to be conveyed is 0.05 m^3/s, how many pipelines are needed?
   b) What is maximum permissible height of the summit above the water level in the main canal so that the water pressure at the summit may not fall below 20 kPa absolute, the barometer reading being 10 m of water?

3. Verify whether the following suggested distribution of discharge in the pipelines of the network shown in figure below is satisfactory by using Hardy-cross method. If not, determine the proper distribution. If the elevation at point B is 50 m and pressure head is 40 m and the elevation at D is 40 m, find the pressure at D. [8+2]

Line	AB	BC	CD	DA	AC
Suggested discharge (units)	58	42	32	18	20



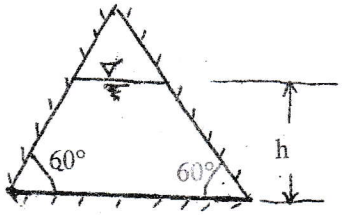
4. a) In the figure below, water flowing through a pipe from the reservoir is suddenly stopped by closing a valve at point B. Draw pressure-time diagram at the 2/3 L form valve of the pipe for one cycle of wave motion. [2]



b) Water flows through a 25 cm diameter 1500m long pipe at rate of 75 lps. The static pressure of water in the pipe is 200m at the downstream end of the pipe and the thickness of the pipe material is 6 mm. If a valve at the downstream end closed in 3 sec estimate the stress in the pipe wall. Take Bulk modulus of water = 2.2×10^9 N/m^2 and Young's modulus of elasticity of steel = 2.1×10^{11}N/m^2. [6]

5. Define the following; Hydraulic depth, Energy slope, gradually varied flow and spatially varied flow. [4]

6. a) In a partially full channel having a triangular section as shown in figure, the rate of discharge $Q = KAR^{2/3}$, in which K = a constant; A = flow area and R = hydraulic radius. Determine the depth at which the discharge is maximum. [5]

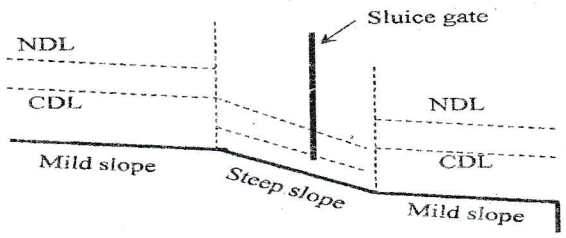


b) The velocity distribution in a channel section may be approximated by the equation $u = u_o(d/d_0)^n$ in which u is the flow velocity at depth d; u_0 is the flow velocity at depth d_0 and n = a constant. Derive expression for the energy and momentum coefficient. [5]

7. a) Define specific energy. Show that the flow is critical when the discharge is maximum for the given specific energy. Water flows at a depth of 1.8 m and velocity of 1.5 m/s in a 3 m wide rectangular channel. Find the width at contraction which just causes critical flow without a change in the upstream depth. [1+4+3]

b) An open rectangular channel carrying a discharge of 4.25 m^3/s is flowing at a depth of 1.15m with energy of 1.2 m and a width of 3 m. The flow encounters a simultaneous gradual contraction to a width of 1.5 m and a smooth downwards step of 0.6 m. With these flow conditions, determine the depth of the downstream flow. [4]

8. a) Sketch the flow profile: [4]



b) Justify analytically that A_3 curve meets the y_c line and channel bottom normally. [4]

9. What is hydraulic jump? Why is energy principle not applied for the analysis of the jump? Water flows in a 5 m wide rectangular channel at Froude number 3.5; the depth of flow is 1.2 m. If water undergoes a hydraulic jump, what is the Froude number downstream of jump? [1+1+4]

10. Explain the Tractive Force Method of designing Mobile boundary channel. Show the shear stress distribution on the Alluvial channel boundary with values. [3+3]

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