

BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)

CLASS: BTECH
BRANCH: CIVIL

SEMESTER : VII
SESSION : MO/2022

SUBJECT: CE416 OPEN CHANNEL FLOW

TIME: 3:00 Hours

FULL MARKS: 50

INSTRUCTIONS:

1. The question paper contains 5 questions each of 10 marks and total 50 marks.
 2. Attempt all questions.
 3. The missing data, if any, may be assumed suitably.
 4. Before attempting the question paper, be sure that you have got the correct question paper.
 5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.
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- Q.1(a) What are the expressions for section factor and conveyance for a rectangular channel? [2]
Q.1(b) Derive the continuity equation for a 2-D flow in a channel. [3]
Q.1(c) The velocity distribution in a rectangular channel of width B and flow-depth D was approximated as $v = 3d^{1/2}$, d being variable flow-depth from the channel bottom. Calculate the average velocity and correction coefficients α and β . [5]
- Q.2(a) Dimension of C is while that of N is..... [2]
Q.2(b) Water flows in a rectangular channel 2m wide with flow depth=0.5m, flow velocity=3 m/s and kin. Viscosity = 10^{-6} m²/s. Find the state of flow. [3]
Q.2(c) A trapezoidal channel with 10 m wide bottom and 1:1 side slope carries a discharge of 30 m³/s at 3.0 m flow-depth. Calculate the specific energy and critical depth. [5]
- Q.3(a) Describe water surface profiles formed on critical channels. [2]
Q.3(b) A rectangular channel is so regulated that the slope of the energy gradient is 4×10^{-4} . The bottom slope is 3×10^{-3} and the velocity is 3m/s at a point where the depth is 2m. At what rate is the depth changing? Is the stream shallower or deeper downstream? [3]
Q.3(c) A river which is 50m wide and 4m deep has bed slope 1 in 10000. Compute the approximate length of the backwater curve produced by an afflux of 3 m. $N=0.03$. [5]
- Q.4(a) What is a submerged hydraulic jump? [2]
Q.4(b) Describe some of the merits and demerits of a hydraulic jump. [3]
Q.4(c) A hydraulic jump takes place in a rectangular channel with sequent depths of 0.25 m and 1.50 m at the beginning and end of the jump respectively. Estimate the (i) discharge per unit width and (ii) energy loss. [5]
- Q.5(a) What is a negative surge in a channel. [2]
Q.5(b) Derive Saint Venant's Equation for unsteady flow. [3]
Q.5(c) The values of K and X for a certain reach of river are 4.4 hrs and 0.1 respectively. Route the inflow hydrograph whose co-ordinates are: [5]

Period (hrs)	0	2	4	6	8	10	12	14	16	18	20
Inflow (m ³ /s)	1170	2695	3814	3829	3421	2967	2454	2188	1862	1515	1170

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