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

CLASS: BTECH **SEMESTER : VI**
BRANCH: CEED **SESSION : SP/2023**

SUBJECT: CE416 OPEN CHANNEL FLOW

TIME: 3 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.

			CO	BL
Q.1(a)	Differentiate, with examples, between (i) sub-critical laminar and supercritical turbulent flows (ii) Prismatic rigid and non-prismatic alluvial channels.	[4]	1	K3
Q.1(b)	Water flows in a rectangular channel 1m wide at a depth of 0.1 m and a velocity of 1.5 m/s. Find the state of flow. Dynamic viscosity of water = 10^{-3} Pa-s	[6]	2	K2
Q.2(a)	Show that relation between the alternate depths y_1 and y_2 in a rectangular channel can be expressed by $\frac{2y_1^2y_2^2}{(y_1+y_2)} = (y_c)^3$ where y_c is the critical depth.	[4]	2	K3
Q.2(b)	Design a most efficient trapezoidal channel with side slopes 1:1.5 which is required to carry a discharge of 25 m^3/s with a longitudinal slope of 1m in 2 km. N=0.02	[6]	3	K4
Q.3(a)	With a neat sketch, draw all the surface profiles formed when a mild slope meets a steep slope which then meets a mild slope.	[4]	3	K5
Q.3(b)	A rectangular channel 10 m wide carries a discharge of 30 cumecs. It is laid at a slope of 0.0001. If a section in this channel the depth is 1.6 m, how far (upstream od downstream) from the section will the depth be 2 m? N = 0.015	[6]	4	K4
Q.4(a)	What is a surge? Describe different types of surges.	[5]	2	K3
Q.4(b)	A spillway discharges flow at a rate of 7.75 $m^3/s/m$. At the downstream horizontal apron the depth of flow was found to be 0.50 m. What tailwater depth is needed to form a hydraulic jump? If a jump is formed, find its (a) type, (b) length, (c) head loss, (d) energy loss as a percentage of the initial energy, and (e) profile	[5]	4	K5
Q.5(a)	What is flood routing? Derive Saint Venant's Equation for unsteady flow.	[1+3]	2	K3
Q.5(b)	The values of K and X for a certain reach of river are 4.0 hrs and 0.15 respectively. Route the inflow hydrograph whose co-ordinates are:	[4+2]	4	K4

Period (hrs)	0	3	6	9	12	15	18	21
Inflow (m^3/s)	800	950	1100	1325	1300	1250	975	800

Also estimate the time to peak and lag of the routed hydrograph.

::::::26/04/2023::::::M