Total number of printed pages: 2

PG/Semester 1st/ PCEW102

2023

Open Channel Flow

Full Marks : 100

Time : Three hours

The figures in the margin indicate full marks for the questions.

*Answer **any five** questions.*

1.	a)	Explain the phenomenon of the depth of flow for the channel transitions a) with hump and b) with increase in channel width.	10
	b)	A rectangular channel has a width of 2.0 m and carriers a discharge of 4.80 m3/s with a depth of 1.60 m. at a certain section a small, smooth hump with a flat top and of height 0.50 m is proposed to be built. a) Estimate the water surface elevation on the hump and at a section upstream of the hump. (b) Estimate the minimum size of the hump to cause critical flow over the hump.	10
2	a)	For hydraulic jump in rectangular channel derive the equation for sequent depth ratio and energy loss.	10
	b)	Derive the differential equation of gradually varied flow.	10
3	a)	A horizontal trapezoidal channel of 2.0-m bed width and side slopes 2 horizontal: 1 vertical carries a discharge of 6.225 m3/s at a depth of 0.20 m. If a hydraulic jump takes place in this channel, calculate the sequent depth and energy loss.	10
	b)	Calculate the bottom width of a channel required to carry a discharge of 15.0 m^3/s as a critical flow at a depth of 1.2 m, if the channel section is (a) rectangular, and (b) trapezoidal with side slope 1.5 horizontal: 1 vertical.	10
4		Write Short Notes On: a) Hydraulic Jump and its types b) Flow Profiles of GVF c) Surges d) Types of open channel	5 x 4 =20
5		Sketch the possible GVF profiles in the following serial arrangement of channels and control. The flow is from left to right: a) mild – sluice gate – steep – horizontal – sudden drop (b) steep – steeper–mild – milder slope	4 x 5 =20

		(c) steep – mild – sluice gate – mild – sudden drop (d) sluice gate – adverse – horizontal – steep slope	
6	a)	A rectangular channel carries a flow with a velocity of 0.65 m/s and depth of 1.40 m. If the discharge is abruptly increased twice by a sudden lifting of a gate on the upstream, estimate the velocity and the height of the resulting surge.	10
	b)	A sluice gate in a wide channel controls the flow of water. When the flow in the downstream channel was at a depth of 2.0 m with a velocity of 4.0 m/s, the sluice gate was partially closed, instantaneously, to reduce the discharge to 25% of its initial value. Estimate the velocity and depth at the gate as well as the surface profile of the negative wave downstream of the gate.	10