PAPER ID-310855

Subject Code: KCE053

Roll No: | | | | | | | | | | | | | |

BTECH
(SEM V) THEORY EXAMINATION 2023-24
OPEN CHANNEL FLOW

TIME: 3 HRS **M.MARKS: 100**

Note: *Attempt all Sections. If require any missing data; then choose suitably.*

SECTION A

1. Attempt *all* questions in brief. **2 x 10 = 20**

Q no.	Question	Marks	CO
a.	Differentiate between prismatic & non prismatic channel.	2	1
b.	What are the various types of flow in open channels?	2	1
c.	Define critical depth and normal depth.	2	2
d.	Write the differences between GVF & RVF.	2	2
e.	Differentiate between jump and surge.	2	3
f.	Define energy dissipater.	2	3
g.	What is spatially varied flow?	2	4
h.	Define bottom racks.	2	4
i.	Which factor affect the flow through culvert?	2	5
j.	Explain constrictions.	2	5

SECTION B

2. Attempt any *three* of the following: **10x3=30**

a.	Derive the relationship between critical depth and specific energy for rectangular channel.	10	1
b.	Explain the standard fourth order Runge-Kutta method to solve the basic differential equation of GVF.	10	2
c.	Discuss positive and negative surges in open channels, elucidating their causes, effects, and mitigation strategies.	10	3
d.	Explain the fundamental principles of Spatially Varied Flow (SVF) and its significance in open channel hydraulics. Provide two examples illustrating real-world scenarios where SVF occurs.	10	4
e.	What is the importance of velocities for culvert design? Explain with neat sketch main components of culvert.	10	5

SECTION C

3. Attempt any *one* part of the following: **10x1=10**

a.	Explain most efficient channel and find the expression for most efficient rectangular channel section.	10	1
b.	Explain flow properties of open channel flow in details.	10	1

4. Attempt any *one* part of the following: **10x1=10**

a.	Explain the equation governing gradually varied flow (GVF) in open channels. Discuss the assumptions and limitations associated with this equation.	10	2
b.	A rectangular channel 7.5m wide has a uniform depth flow 2.0 m and has a bed slope of 1 in 3000. If due to weir constructed at a downstream end of the channel, water surface is raised by 0.75m, determine the water surface slope with respect to horizontal at the section. Assume manning's coefficient = 0.02.	10	2

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5. Attempt any *one* part of the following: 10x1=10

a.	Explain the characteristics of rapidly varied flow, emphasizing the conditions under which hydraulic jumps occur in open channels.	10	3
b.	In a hydraulic jump occurring in a rectangular channel of 3 m, the discharge is 7.5 m^3/s and the depth before the jump is 0.28 m. Estimate sequent depth and energy loss in the jump.	10	3

6. Attempt any *one* part of the following: 10x1=10

a.	A rectangular channel 2 m wide carries a discharge of 3.5 m^3/s at a Froude number of 0.30. A 2 m long parallel longitudinal bars bottom rack having E = 0.2 is provided at a section. Super critical flow is known to occur over the rock. Estimated the discharge diverted out.	10	4
b.	Discuss the classifications and solutions associated with Spatially Varied Flow (SVF). Provide two distinct classifications and explain how these classifications impact the behavior of flow profiles in open channels.	10	4

7. Attempt any *one* part of the following: 10x1=10

a.	Explain briefly the transitions of subcritical and supercritical flow.	10	5
b.	Explain the significance of non-prismatic channel sections in open channel hydraulics. Discuss two design considerations specific to non-prismatic sections, emphasizing their implications for flow characteristics.	10	5