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Total No. of Pages : 02

Total No. of Questions : 09

B.Tech.(CE) (2011 Onwards) (Sem.-4)

FLUID MECHANICS-II

Subject Code : BTCE-404

Paper ID : [A1174]

Time : 3 Hrs.

Max. Marks : 60

INSTRUCTION TO CANDIDATES :

1. SECTION-A is **COMPULSORY** consisting of **TEN** questions carrying **TWO** marks each.
2. SECTION-B contains **FIVE** questions carrying **FIVE** marks each and students has to attempt any **FOUR** questions.
3. SECTION-C contains **THREE** questions carrying **TEN** marks each and students has to attempt any **TWO** questions.

SECTION-A**1. Write briefly :**

- a) On what factors does the upper limit of critical Reynolds number depends upon.
- b) Draw a graph illustrating velocity distribution in laminar and turbulent boundary layer.
- c) The concept of boundary layer divides the flow field into which two zones.
- d) Show the velocity distribution for ideal and real fluids.
- e) What is a laminar sublayer?
- f) What is the momentum principle?
- g) Define specific energy
- h) What do you mean by critical slope?
- i) What are drawdown curves?
- j) What is a hydraulic jump?

SECTION-B

2. Show that the ratio of boundary layer thickness to displacement thickness (δ/δ^*) for the velocity distribution is given by $u/U_\infty = \sin(\Pi \delta/2)$ is 2.75.
3. For a given specific energy show that the maximum discharge in a rectangular channel occurs at a critical depth.
4. A rectangular channel 4 m wide is narrowed to 2 m width to cause critical flow in the contracted section. If the depth in this section is 1 m calculate the flow, and depth in the 4 m section, neglecting energy losses in the transition. Sketch the energy line and water surface.
5. A river 90 m wide and 3m deep has stable bed and vertical banks with a surface slope of 1 in 2500. Estimate the length of backwater curve produced by an afflux of 2 m. Assume Manning's $n = 0.035$.
6. Prove that for hydraulically most efficient rectangular channel, the width should be two times the depth of flow, so that the hydraulic radius is equal to half the depth of flow.

SECTION-C

7. A pipe 10 cm in diameter and 1000 m long is used to pump oil of viscosity 8.5 poises and sp. Gr. 0.92 at the rate of 1200 lit/min. The first 300 m of the pipe is laid along the ground sloping upwards at 10° to the horizontal and the remaining pipe is laid on the ground sloping upwards at 15° to the horizontal. State whether the flow is laminar or turbulent? Determine the pressure required to be developed by the pump and the power of the driving motor if the pump efficiency is 60%. Assume suitable data for friction factor f , if required.
8. A hydraulically efficient trapezoidal channel has side slopes of 1:1. It is required to discharge $14 \text{ m}^3/\text{s}$ with a gradient (channel slope) of 1 in 1000. If unlined, the value of Chezy's C is 45. If lined with concrete, the value is 70. If the cost per m^3 of excavation is three times the cost per m^3 of lining, will the lined or unlined channel be cheaper.
9. What are the various types of Water surface profiles? Explain along with neat sketches.