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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 have to attempt any FOUR questions.
3. SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.

SECTION-A**Q1. Answer briefly :**

- a) How is the concept of critical Reynolds number useful in demarcating the regimes of laminar and turbulent flows?
- b) Comment on the arbitrariness of boundary layer thickness.
- c) Sketch the boundary layer separation in a diverging channel by showing atleast three velocity profiles.
- d) Give classification of open channel flow with respect to time.
- e) Show the velocity distribution for ideal and real fluids.
- f) Due to which factors gradually varied flow occurs.
- g) What are backwater curves?
- h) What is a hydraulic jump?
- i) What factors influence the total drag on a body?
- j) What is the momentum principle?

SECTION-B

- Q2. A liquid of kinematic viscosity of $14 \text{ mm}^2/\text{s}$ is flowing down a tube inclined at 40° with the horizontal. When the Reynolds number for flow in the tube is 1500, the intensity of pressure remains constant at all the cross sections of the tube. Determine the diameter of the tube and the discharge through it.
- Q3. What are the causes which result in the separation of boundary layer?
- Q4. A 3.6m wide rectangular channel carries water to a depth of 1.8m. In order to measure the discharge, the channel width is reduced to 2.4m and a hump of 0.3m height is provided in the bottom. Calculate the discharge if water surface in the contracted section drops by 0.15m. Assume no losses.
- Q5. Water discharging from an overall spillway flows to a jump type basin. The discharge intensity is $30 \text{ m}^3/\text{s}/\text{m}$ and the water depth is 1.5m. Find the conjugate depth for the jump to form.
- Q6. Give classification of surface profiles.

SECTION-C

- Q7. Water flows in a channel of the shape of isosceles triangle of bed width 'a' and sides making an angle of 45° with the bed. Determine the relation between depth of flow 'd' and the bed width 'a' for maximum velocity and maximum discharge condition. Use Manning's formula and note that 'd' is less than 0.5a.
- Q8. The normal depth of flow of water, in a rectangular channel 1.5m wide, is 1m. The bed slope of the channel is 0.0006 and Manning's roughness coefficient $n=0.012$. Find the critical depth. At a certain section of the same channel the depth is 0.92 m while at a second section the depth is 0.86m. Find the distance between the two sections (use one reach in the calculations). Also find whether the section is located downstream or upstream with respect to the first section.
- Q9. What conditions are necessary for formation of a hydraulic jump? What are the elements and characteristics of hydraulic jump? Explain different types of jumps along with neat sketches.