303-25

T.E Civil VI CBGS

AH - II

07.12.16

35

Q.P. Code : 577501

(3 Hours) **Maximum Marks 80**

N.B (1) Question no. **1** is compulsory
(2) Attempt any **Three** questions from remaining 5 questions.
(3) Assume any **suitable** data if **necessary** and state it very **clearly**.

Q.1 **Solve any four** 20

a) A horizontal rectangular channel 4 m wide carries a discharge of 16 m^3/s. Determine whether a jump may occur at an initial depth of 0.5 m or not ? If jump occurs, determine the sequent depth to this initial depth. Also determine the energy loss in the jump

b) Write down the methods of preventing the separation of boundary layer

c) Classify and draw different surface profiles in GVF

d) For a constant specific energy of 2.4 N.m/N, calculate the maximum discharge that may occur in a rectangular channel of 4.0 m wide

e) Derive dynamic equation for gradually varied flow

Q.2 a) The velocity distribution in the boundary layer is given as 06

$$u/U = 3/2\ (\eta)-1/2(\eta^2)$$

in which $\eta = (y/\delta)$. Compute (δ^*/δ) and (Θ/δ)

b) Draw the sketch showing laminar Boundary Layer, Turbulent Boundary Layer and Laminar Sub-layer. Explain them in very short 04

c) Velocity distribution in Laminar Boundary Layer is given by $u/U = 2\ (y/\delta)-(y/\delta)^2$ Find out Boundary Layer thickness, Shear stress. 10

Q.3 a) A thin plate is moving in still atmospheric air at a velocity of 5m/s. The length of the plate is 0.6 m and width 0.5 m. Calculate (i) the thickness of the boundary layer at the end of the plate, (ii) drag force on one side of the plate. Take density of air as 1.24 kg/m^3 and $\nu = 0.15$ stokes 06

b) A cylinder rotates at 150 rpm with its axis perpendicular in an air stream which is having uniform velocity of 25 m/s. The cylinder is 1.5m in diameter and 10 m long. Find circulation, lift force and position of stagnation points. Take $\rho_{air} = 1.25\ kg/m^3$ 08

c) Show that co-efficient of lift depends upon the angle of attack. 06

TURN OVER

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Q.4 a) Derive the equation for most economic trapezoidal section 10

b) A concrete lined circular channel of diameter 3 m has a bed slope of 1 in 500. Work out the velocity and flow rate for the conditions of (i) maximum velocity (ii) maximum discharge. C= 50 10

Q.5 a) The normal depth of water in a rectangular channel is 1.5 m wide, is 1 m. The bed slope of the channel is 0.0006 and N = 0.012. Find critical depth. At a certain section of the same channel the depth is 0.92 m while at a second section the depth is 0.86 m. Find distance between the two sections. Also find whether the section is located downstream or upstream w. r. to the first section. 12

b) Show that the head loss in a hydraulic jump formed in a rectangular channel may be expressed as 08

$$\Delta E = (V_1-V_2)^3/2g(V_1+V_2)$$

Q.6 a) In a rectangular channel 3.5 m wide laid at a slope of 0.0036, uniform flow occurs at a depth of 2 m. Find how high the hump be raised without causing afflux? If the upstream depth of flow is to raised to 2.5 m, what should be the height of the hump? take n=0.015 10

b) Design an irrigation channel by Lacey's theory for the following data 10

Full supply Discharge : 14 m^3/s

Silt Factor : 1.0

Side Slope : ½ : 1 (H:V)

N = 0.0225

Bed slope 1 in 5000

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