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AM II W/10 – K.T. Dec 10

Con. 6267-10. **(REVISED COURSE)** **GT-7467**

(3 Hours) **[Total Marks : 100**

N.B.: (1) Question No **1** is **compulsory**.
(2) Attempt any **four** questions from remaining **six** questions.
(3) Assume **suitable** data where **necessary**. State them clearly.

1 Solve any **four** of the following :— 20
(a) Boundary layer seperation
(b) Terminal velocity
(c) Standing-wave flume and venturiflume
(d) M_1, M_2 and M_3 profiles.
(e) Specific energy and specific force curve.

2. (a) Obtain Von Karman momentum integral equation. 10

(b) The velocity distribution in the boundary layer is given by : $\frac{u}{U} = \left(\frac{y}{\delta}\right)^{1/7}$ 10

Calculate the following :
(i) Displacement thickness
(ii) Momentum thickness
(iii) Shape factor
(iv) Energy thickness.

3. (a) Derive an expression for the lift produced on a rotating cylinder placed in a uniform flow field such that the axis of the cylinder is perpendicular to the direction of flow. 10

(b) 2 mm diameter metallic ball of specific gravity 11 is allowed to fall in a fluid of specific gravity 0·9 and viscosity 1·4 N/m². Determine :— 10
(i) Drag force
(ii) Pressure drag and skin friction drag.
(iii) Terminal velocity of ball in fluid.

4. (a) Find the width and depth of a rectangular channel to convey a discharge of 1·45 cumec at a velocity of 0·50 m/s. The bed of the channel has a slope of 0·0001. Take Manning's coefficient N = 0·014. 10

(b) Find a condition for maximum velocity for channel of circular section. 10

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5. (a) Show that the hydraulic mean depth of a trapezoidal channel having the best proportion is half of the minimum depth. 10

(b) A trapezoidal channel having the side slope equal to 60° with the horizontal and laid on a slope of 1 in 750, carries a discharge of 10 m^3/s. Find the width at base and depth of flow for most economical cross section. Take the value of Chezy's C = 66. 10

6. (a) A hydraulic jump occurs in a 0·5 m wide rectangular channel at the point where depth of water flow is 0·15 m and the Froude Number is 2·5. Make calculations for the specific energy, critical and sequent depths, loss of head and the energy dissipated. 10

(b) Uniform flow occures at a depth of 1·5 m in a long rectangular channel 3 m wide and laid to a slope of 0·0009. If Manning's, N = 0·015 calculate :— 10

(i) Maximum height of hump on the floor to produe critical depth.

(ii) Width of contraction w hich will produce critical depth without increasing the upstream depth of flow.

7. (a) Compare Kennedy's theory and Lacey's theory. 10

(b) Design an irrigation channel in alluvial soil according to Lacey's silt theory, given the following data : 10

Slope of channel = 1 : 5000

Lacey's silt factor = 0·9

Channel side slope = $\frac{1}{2}$; 1

Also find the maximum discharge which can be allowed to flow in it.

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