T. E Sem VI (CBGS)

Civil

22/5/15

AH-II

(78)

QP Code : 4977

(3 hours)

Note: Max. Marks 80

Question no.1 is compulsory

Solve any 3 questions out of remaining

Assume data wherever necessary and clearly mention the assumptions made.

Draw neat figures as required.

1. Answer any 4 of the following. 20
   a. Explain surface profiles in open channel
   b. Explain Boundary Layer Separation and control measures
   c. Compare Kennedy's and Lacey's theory
   d. Explain specific energy curve.
   e. Write a note on Standing Wave Flume.

2. a. A trapezoidal channel with a side slope of 1:1 has to be designed to convey 10 m^3/sec at a velocity of 2 m/sec, so that the amount of concrete lining for the bed and sides is minimum. Calculates the area of lining required for one meter length of channel. If the rugosity coefficient N = 0.015, calculate the bed slope the channel for uniform flow. 10

   b. Water flows at the rate of 1m^3/sec along a channel of rectangular section 1.6 m in width. Calculate the critical depth. If a standing wave occurs at a point where the upstream depth is 0.2 m, what would be the rise in water level produced and the power lost in standing waves. 10

3. a. A 1.6m wide, 5m long plate moves through stationary air of density 1.22 x 10^{-3} gm/cc and viscosity 1.8 x 10^{-4} poise at a velocity of 1.75 m/sec parallel to its length. Determine the drag force on one side of the plate (a) assuming laminar flow conditions, (b) assuming turbulent flow condition. 12

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b. A kite of dimensions 0.8 x 0.8m and weighing 6 N is maintain in air at an angel of 10° to the horizontal. The string attached to the kite makes an angel of 45° to the horizontal and at this position, the drag and lift coefficients are estimated to be 0.6 and 0.8 respectively. Determine wind speed and tension in the string. 08

4. a. Water flows in a rectangular channel of 4 m width at a depth of 2.50 m and a velocity of 2.25 m/sec. If the width of channel is reduced to 2.50 m and the bed of channel is raised by 0.20m at a section, how will the level of water surface in the channel be affected? 10

b. Design an irrigation channel in alluvial soil according to Lacey's silt theory. Given the following data, slope of channel = 1:5000, Lacey's silt factor = 0.9. 10

5. a. Derive boundary layer thickness, local coefficient of drag and coefficient of drag for the given velocity profile: 15

$$\frac{u}{U} = \frac{3}{2}\left(\frac{y}{\delta}\right) - \frac{1}{2}\left(\frac{y}{\delta}\right)^3$$

b. Explain discharge curve in open channel. 05

6. a. A circular cylinder of 1m diameter and 10 m length is rotated at 420 rpm about its axis when it is kept in air stream with 11.0 m/sec velocity perpendicular to its axis. Determine (i) circulation around the cylinder, (ii) theoretical lift and lift coefficient, (iii) position of stagnation point, (iv) actual drag and lift force on the cylinder and (v) actual resultant force and its direction. 10

b. Derive dynamic equation for gradually varied flow in case of wide rectangular channel. Also state assumptions made for the same. 10

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