T.E Civil VI CBGS

A407 - 40
B301 - 40
B 302 - 40
B303 - 14

AH - II

184

20.5.16

QP Code : 31655

(3 hours)

Max. Marks: 80

Note:

1. **Question no.1 is compulsory**
2. Solve **any 3 questions** out of remaining
3. Assume data wherever necessary and clearly mention the assumptions made.
4. Draw neat figures as required.

Q.1 **Solve any four** 20

a) Define specific force and explain specific force curve in detail.

b) Explain S1, S2, S3 profile in detail with neat sketch.

c) What are the defects in Lacey's theory?

d) Differentiate between streamlined body and bluff body.

e) How will you determine whether a boundary layer flow is attached flow, detached flow or on the verge of separation.

Q.2 a) Assuming that the velocity distribution in the boundary layer is given by $\frac{v}{V}=\left(\frac{y}{\delta}\right)^{1/7}$ calculate $\frac{\delta^*}{\delta}, \frac{\theta}{\delta}$ and $\frac{\delta_E}{\delta}$. If at a certain section, free stream velocity V was observed to be 10 m/s and the thickness of the boundary layer as 25 mm, then calculate the energy loss per unit length due to the formation of boundary layer. Take ρ = 1.226 kg/m^3 10

b) Derive Von Karman's momentum integral Equation. 10

Q.3 a) A cylinder 1.2 m in diameter is rotated about its axis in air having a velocity of 128 km per hour. A lift of 5886 N per meter length of the cylinder is developed on the body. Assuming ideal fluid theory, find rotational speed and the location of the stagnation points. Take ρ = 1.236 kg/m^3 10

b) A metallic ball of diameter 2 X 10^{-3} drops in a fluid of sp.gr. 0.95 and viscosity 15 poise. The density of the metallic ball is 12000 kg/m^3. Find : 10

(i) The drag force exerted by fluid on metallic ball.
(ii) The pressure drag and skin friction drag.
(iii) The terminal velocity of ball in fluid.

P.T.O

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Q.4 a) Define the best section of channel and derive the conditions of best trapezoidal channel section. 06

b) A flow of 100 litres per second flows down in rectangular laboratory flume of width 0.6 m and having adjustable bottom slope. If Chezy's C is 56 determine the bottom slope necessary for uniform flow with a depth of flow 0.3 m. Also find the conveyance and the state of flow (i.e., tranquil or rapid) 08

c) What is Chezy's formula? How it is derived? Show that the Chezy's coefficient $C = \frac{R^{1/6}}{n}$, where R is the hydraulic radius and n is the Manning's roughness coefficient. 06

Q.5 a) In a rectangular channel 3.5 m wide laid at a slope of 0.0036, uniform flow occurs at depth of 2 m. Find how high can the hump be raised without causing afflux? If the upstream depth of flow is to be raised to 2.5 m, what should be the height of the hump? Take manning's n equal to 0.015. 10

b) A trapezoidal channel having bottom width 8 m and side slope 1:1, carries a discharge of 80 m^3/sec. Find the depth conjugate to initial depth of 0.75 m before the jump. Also determine the loss of energy in the jump. 10

Q.6 a) Compare Lacey's and Kennedy's silt theory. 05

b) What do you understand by (a) regime channel, (b) initial and permanent regime of channels? 05

c) A stable channel is to be designed for a discharge of 40 m^3/sec and silt factor of unity. Calculate the dimensions of the channel using Lacey's regime equation. Also calculate the dimensions of the channel if it were to be designed on the basis of Kennedy's method with C.V.R equal to unity, and the ration of bed width to depth if flow the same as obtained from Lacey's method 10

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