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Name of Examination : **Winter 2020** - (Preview)

Course Code & Course Name : **CE305 - Fluid Mechanics-II**

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Maximum Marks : **60**   Duration : **3 Hrs**

Edit   Print   View Answer Key   Close   **Answer Key Submission Type:** Marking scheme with model answers and solutions of numerical

Instructions:

1. *All questions are compulsory.*
2. *Illustrate your answer with suitable figures/sketches wherever necessary.*
3. *Assume suitable additional data; if required.*
4. *Use of logarithmic table, drawing instruments and non programmable calculators is allowed.*
5. *Figures to the right indicate full marks.*

1)   Q(a) compulsary. Solve either Q (b) or Q (c)

(a)   A thin 0.3 m width and 1.0 m length moves at 3.5 m/s velocity in still atmospheric air of density 1.25 kg/m^3 and kinematic velocity 1.5 x 10^{-5} m^2/s. Calculate the drag force on the plate (a) when 0.3 m side and (b) 1.0 m side is parallel to the direction of motion.   [5]

(b)   Define displacement thickness and derive equation for displacement thickness.   [5]

(c)   Define Drag and lift. Explain Drag types. Also calculate the force in Newtons on a cylindrical pier of bridge of 1 meter in diameter is submerged to a depth of 10 m in a river at 20°C. Water is flowing past at a velocity of 1.2 m/s. Take Cd= 0.35. Assume suitable data.   [5]

2) (a) i). What is turbulence? List classification of turbulence.   [2]

ii). A turbulent flow of water occurs in a pipe of 0.5 m diameter. The velocity profile is measured experimentally and found to be closely approximated by the equation $u = 3 + \frac{1}{3}\log(y)$ where, velocity u is in m/s and the distance y from the wall is measured in meters. The shear stress at a point 0.1 m from the wall has been determined analytically and found to be 9 N/m^2. Calculate the values Prandtl's mixing length.   [3]

(b) i). List minor losses for flow through pipes & explain any two.   [3]

ii). A pipe carrying 0.08 cumecs of water suddenly contracts from 30 cm to 15 cm diameter. Calculate the coefficient of contraction if the loss of head is 0.5 m.   [2]

3) (a) i). Define geometric elements of channel and discuss the basics of geometric elements of channel.   [3]

ii). Compute the hydraulic radius, hydraulic depth, section factor of trapezoidal channel of base width 6.67 m and side slopes of 1V : 2H. The depth of flow in channel is 2 m.   [2]

(b) i). Define most economical section of channel and give properties of most economical trapezoidal channel.   [2]

ii). A trapezoidal channel 3 m wide at the base has a side slope as 2 V : 1 H. Using Manning's formula, determine the discharge in the channel, when water is flowing 1 m deep. Take the bed slope as 1 in 652 and N = 0.03.   [3]

4)   Q(a) compulsary. Solve either Q (b) or Q (c)

(a)   Explain types of non uniform flows & different types of gradually varying flow profiles.   [5]

(b)   Derive the expression for critical depth & critical velocity.   [5]

(c)   The discharge of water through a rectangular channel of width 6 is 18 cumecs, when depth of flow water is 2 m. Calculate (i) specific energy of flowing water (ii) critical depth and critical velocity (iii) value of minimum specific energy.   [5]

5) (a)   Show that for a hydraulic jump in a horizontal jump in horizontal rectangular channel, the alternate depths are related by the below expression with usual notations.   [5]
$$y_2 = \frac{y_1}{2}\left[\sqrt{8F_1^2 + 1} - 1\right]$$

(b)   A jet of water 8 cm in diameter and moving with a velocity of 25 m/s impinging on a plate. Determine the pressure on the plate, when   [5]
(i) the plate is fixed
(ii) the plate is moving with a velocity of 10 m/s in the direction of jet.
Also determine the work done per second by the jet.

6)   Q(a) compulsary. Solve either Q (b) or Q (c)

(a)   What is turbine? List the classification of turbine and differentiate between impulse turbine & reaction turbine.   [5]

(b)   Explain with suitable diagram centrifugal pump with respect to priming, its component and working principle.   [5]

(c)   Explain in details different heads & efficiencies of a centrifugal pumps.   [5]

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