40+40+40+34+5

T.E Civil VI CBSGS

Q.P. Code : 16410

26.5.17

(16

(Three Hours)

80 Marks

N.B. (i) Question **No. 1** is compulsory

(ii) Attempt any **Three** Questions out of **Five** Questions

(iii) Illustrate with figures whenever necessary

(iv) Assume suitable data if necessary and state it clearly

1 **Solve any four**

a) Explain the significance of channels of most efficient sections [20]

b) How hydraulic jump is classified according to Froude number of incoming supercritical flow

c) Derive expression for energy loss in hydraulic jump

d) What is meant by Magnus effect

e) What do you understand by displacement thickness and momentum thickness of boundary layer

f) Write design steps in Kennedy's theory of unlined alluvial channels

2 (a) A trapezoidal channel to carry 142 m^3/min of water is designed to have a minimum cross section find the bottom width and depth if the bottom slope is 1 in 1200, the side slopes at 45^0 and chezy's constant C = 55. [10]

2(b) [10]

The discharge of water through a rectangular channel of width 6m is 18 m^3/s when depth of flow of water is 2m. Calculate specific energy of flowing water, critical depth, critical velocity and minimum specific energy.

3 (a) Derive dynamic equation of gradually varied flow [10]

3(b) A cylinder 1.2m in diameter is rotated about its axis in air having a velocity of 128 km/hr. A lift of 5886 N/m length of cylinder is developed in the body. Assuming ideal fluid theory, find the rotational speed and location of stagnation points. Given density of air is equal to 1.236 kg/m^3. [10]

4 (a) Determine the thickness of boundary layer at tailing edge of smooth plate of length 4m and of width 1.5m, when the plate is moving with a velocity of 4 m/s in stationary air. Take kinematic viscosity of air as 1.5 x 10^{-5} m^2/s. Also, determine the total drag on one side of the plate assuming that the boundary layer is laminar over entire length of plate taking density of air 1.226 kg/m^3. [10]

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4 (b) Explain the terms: terminal velocity, circulation, pressure drag, profile drag and friction drag. [10]

5(a) Describe method of designing a canal based on Lacey's theory. [10]

5(b) Design a channel section by Kennedy's theory, for a given data [10]

Discharge is 28 cumecs

Kutters constant N is 0.0225

Critical velocity ratio is 1

Side slope ½ : 1

B/D = 7.6

Find also the bed slope of channel

6 Solve the followings: [20]

1. A rectangular channel of width 4m is having bed slope of 1 in 1500. Find the maximum discharge through the channel. Take C=50.
2. A circular disc 3m in diameter is held normal to a 26.4 m/s wind of density 0.0012 gm/cc. What force is required to hold it at rest. Assume coefficient of drag of disc is 1.1.
3. Derive conditions for most economical rectangular section
4. Write applications of hydraulic jump
