Total No. of Questions :6]

SEAT No. :

P5056

[Total No. of Pages : 3

T.E./Insem.-605
T.E.(Civil) (Semester - I)
FLUID MECHANICS - II
(2015 Pattern)

Time : 1 Hour] *[Max. Marks :30*

Instructions to the candidates:

1) *Answer Q.1 or Q.2, Q.3 or Q.4 and Q.5 or Q.6*
2) *Neat diagrams must be drawn wherever necessary.*
3) *Figures to the right indicate full marks*
4) *Use of non programmable electronic pocket calculator is allowed.*
5) *Assume suitable data, if necessary.*

Q1) a) Determine the frequency of vortex shedding for a 4 mm diameter transmission cable in wind of 73 km/hr speed at 20°C. Take $\mu=1.86\times10^{-5}$ N.s/m^2 and ρ_{air} = 1.21 kg/m^3. **[3]**

b) Explain with neat sketch the term "Polar Diagram". **[3]**

c) The water is flowing with a velocity of 1.6 m/s in a pipe of length 2600m and of diameter 500mm; the thickness of the pipe wall is 10mm and the valve is closed suddenly at the end of the pipe. Find the rise in pressure if the pipe is considered to be elastic. Take E = 19.62×10^{10} N/m^2 for pipe material and K=19.62×10^4N/cm^2 for water. Calculate the circumferential and longitudinal stress developed in the pipe wall. **[4]**

OR

Q2) a) Derive the following expression for rise in pressure due to instantaneous closure of valve in elastic pipe. **[4]**

$$P = V\sqrt{\frac{\rho}{\left(\frac{1}{K}+\frac{D}{E.t}\right)}}$$

b) A man descends to the ground from an areoplane with the help of a parachute which is hemispherical having a diameter of 4.5 m against the resistance of air with a uniform velocity of 25m/s. Find the weight of the man if the weight of parachute is 9.81N. Take C_D=0.6 and ρ_{air}=1.24 kg/m^3. **[4]**

c) Explain with neat sketch the following term:

i) Lift force

ii) Drag force **[2]**

P.T.O.

Q3) a) Calculate the critical depth and the corresponding specific energy for a discharge of 4 m^3/s for the following channels.

i) Rectangular channel of width 3m

ii) Triangular channel with side slope 0.5H: 1V **[4]**

b) The rectangular channel of width 8m, carries a discharge of 17 m^3/s with depth of flow of water is 1.5m. Calculate:

i) specific energy

ii) critical depth

iii) critical velocity and

iv) minimum specific energy. **[4]**

c) Explain in brief with neat sketches "Velocity distribution in open channel". **[2]**

OR

Q4) a) A rectangular channel 5.3m wide has a discharge of 10.50 m^3/s at a velocity of 1.3m/s. At a certain section the bed width is reduced to 3.0 m through a smooth transition. A smooth flat hump is to be built in this contracted section to cause critical flow for flow measurement purposes. Estimate the height of the hump necessary for this purpose. Assume no energy loss at the transition (Refer Fig. 4 a). **[5]**

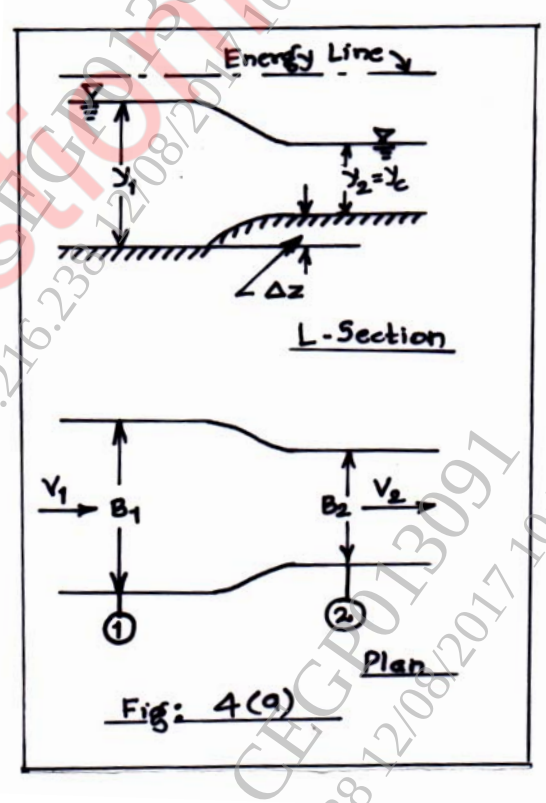

Fig: 4(a)

b) Derive the Continuity equation with usual notations for open channel flow. **[5]**

Q5) a) A trapezoidal channel with side slopes of 2 Horizontal: lVertical, is to be designed as the most efficient channel to carry 15 m^3/s discharge at a slope of 1/6000. Assuming Manning's n = 0.012, determine the dimensions of the channel section and draw the cross section of channel. **[5]**

b) Derive the expression for the "loss of energy" with usual notations for a hydraulic jump. **[5]**

OR

Q6) a) Explain in detail various "types of hydraulic jump" with neat sketches. **[5]**

b) Derive the conditions for most efficient triangular channel section. **[5]**

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