Total No. of Questions : 8] **SEAT No. :**

P2916 **[Total No. of Pages : 3**

[5669]-505

T.E. (Civil)

FLUID MECHANICS - II

(2015 Pattern)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Neat diagrams must be drawn wherever necessary.***
2) ***Figures to the right indicate full marks.***
3) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
4) ***Assume suitable data, if necessary.***
5) ***Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6., Q.7 or Q.8.***

Q1) a) Explain the following terms with neat sketches : **[3 + 3]**

i) Surge Tank and its functions

ii) Water Hammer

b) Derive the energy equation with usual notations for open channel flow. **[6]**

c) Following data is given for the irrigation channel of trapezoidal section :

i) Side slope = 3H: 2V

ii) $Q = 12 m^3/s$

iii) Longitudinal slope is 1in 4500 and

iv) The channel is to be lined for which the value of Manning's coefficient is n = 0.012

Find the most economical section of the channel. **[8]**

OR

Q2) a) Following data is related to the flat plate moving in stationary air **[6]**

i) Speed of plate = 50 km/hr

ii) Size of the plate = (1.5×1.5)m

iii) Density of Air = $1.16 kg/m^3$

iv) Coefficient of lift = 0.75

v) Coefficient of drag = 0.15 Find :

i) Lift force

ii) Drag force

iii) Resultant force

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b) Derive the conditions for the most economical trapezoidal Channel section. **[6]**

c) A sluice gate discharges water into a horizontal rectangular channel with velocity of 5m/s and the depth of flow 0.30m, width of channel is 6m. Determine whether hydraulic jump will occur and if so, determine it's height and loss of energy per Newton of water. Also Determine power lost in the jump. **[8]**

Q3) a) Define Centrifugal pump. Explain with neat sketch working of centrifugal pump. **[8]**

b) Ajet of water having a velocity of 20 m/s impinging on a curved vane which is moving with a velocity of 6 m/s. The jet makes an angle of 20º with the direction of motion of vane at the entry and leaves the vane at an angle of 120º. If the water enters and leaves the vane without shock, find the vane angles at inlet and outlet. Also find work done per second per unit weight of water striking the vane. Neglect friction **[8]**

OR

Q4) a) Derive the expression for force exerted by the jet on series of moving curved vanes. Consider jet is striking at the centre of symmetric vane. Also find efficiency and further derive the condition for maximum efficiency. **[8]**

b) Explain in brief : **[8]**

i) Cavitation in centrifugal pump

ii) Heads in centrifugal pump

iii) Priming of centrifugal pumps

Q5) a) Derive the expression for specific speed of hydraulic turbine $Ns = \frac{N\sqrt{P}}{H^{5/4}}$. **[8]**

b) A Pelton wheel is revolving at a speed of 180 r. p. m and develops 5000KW when working under a head of 200m with an overall efficiency of 70%. Determine unit speed, unit discharge and unit power. The speed ratio for the turbine is given as 0.47. Also find the speed, discharge and power when this turbine is working under a head of 140m. **[10]**

OR

Q6) a) Sketch a layout of typical hydroelectric power plant and explain in brief function of each element. **[8]**

b) A Pelton wheel for the following specifications : **[10]**

Shaft Power = 12,000Kw Head = 350m

Speed = 750rpm Overall efficiency = 80%

and the jet diameter is not to exceed one sixth of the wheel diameter.

Determine :

i) Diameter of wheel

ii) No of jet required

iii) Diameter of the jet. Take C_V = 0.98 and Speed ratio = 0.45

Q7) a) Classify channel bed slope and show various zones. **[6]**

b) Derive the differential equation for Gradually Varied Flow usual notations.

$$\frac{dy}{dx} = \frac{S_o - S_f}{1 - \frac{Q^2 T}{gA^3}}$$ **[10]**

OR

Q8) a) Explain "Direct step method" of GVF computations. **[6]**

b) A rectangular channel 15m wide carries a discharge with a normal depth of 3.2m. The bed slope of the channel is 1 in 3500. If at a certain section, the depth of flow is raised to 5.0m by constructing a weir across the channel, how far upstream of the section, the depth of flow would be within 10% of the normal depth. Use step method. Take two steps. Assume Manning's coefficient as 0.016. Sketch the profile. **[10]**

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