Total No. of Questions : 12]

SEAT No. : ____

P3242

[Total No. of Pages : 3

[5353] - 105
T.E. (Civil) (End Sem.)
FLUID MECHANICS - II
(2012 Pattern)

Time :2.½ 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) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8, Q.9 or Q.10, Q.11 or Q.12***

Q1) a) Differentiate between bluff body and streamlined body. **[2]**

b) A metallic ball of diameter 2.1×10^{-3}m drops in fluid of sp. gravity 0.96 and viscosity 16 Poise. The density of metallic ball is 12010 kg/m^3. Find:

i) The drag force exerted by fluid on metallic ball;

ii) The pressure drag and skin friction drag and

iii) The terminal fall velocity of ball in fluid. **[6]**

OR

Q2) a) Describe in brief the phenomenon of "Water Hammer". **[2]**

b) Water flows through a 2.90 km long pipeline at velocity of 2.15 m/s when the valve at the end of the pipe is fully open and the head acting there is 29.6 m. The valve is desired to be closed fully in 15 seconds in such a manner that the velocity of water in the pipe is decelerated uniformly. Calculate the required area of the valve opening at 5 and 10 seconds from start, if the initial opening area is equal to the pipe cross sectional area. **[6]**

Q3) Discuss with neat sketches the following terms: **[6]**

a) Classification of Channels and

b) Channel Flows

OR

Q4) Explain in brief: i) Specific Force diagram ii) Channel Transitions **[6]**

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Q5) A maximum discharging trapezoidal channel of best section has a depth of 2.1 m and fall of 1:2680. Calculate the discharge and draw a section of channel with side of 1:1. **[6]**

OR

Q6) Derive the following expression for the loss of energy of hydraulic jump in horizontal rectangular channel. **[6]**

$$\Delta E = \frac{(y_2 - y_1)^3}{4 y_1 y_2}$$

Q7) a) Derive expression for the "work done by the jet" in case of flat plate inclined and moving in the direction of jet. **[6]**

b) Draw neat labeled sketch of a Centrifugal pump and Also explain its working. **[6]**

b) A centrifugal pump with 1 .25m diameter runs at 210 rpm and pumps 1890 lit/sec, the average lift being 6. 1 m. The angle which the vane makes at exit with the tangent to the impeller is 27° and the radial velocity of flow is 2.6 m/s. Determine the manometric efficiency and the least speed to start the pumping against the head of 6.lm, the inner diameter of the impeller being 0.6m. **[6]**

OR

Q8) a) Explain the working of "reciprocating pump" with neat sketch. **[6]**

b) Explain in brief with neat sketches "types of impellers" related with centrifugal pump. **[6]**

c) A 8.5 cm diameter jet having a velocity of 27m/s strikes a flat plate, the normal of which is inclined at 45° to the axis of jet. Find the normal pressure on the plate:

i) When the plate is stationary.

ii) When the plate is moving with velocity of 14 m/s away from the jet.

Also determine the power and the efficiency of the jet when the plate is moving. **[6]**

Q9) a) Draw the neat sketch of hydroelectric power plant. Explain various elements of it. **[8]**

b) Define specific speed. Derive the expression for the same. **[8]**

OR

Q10)a) i) Differentiate between Reaction turbine and Impulse turbine

ii) Explain the "Governing of turbine" **[8]**

b) A Pelton wheel is to be designed for head of 70m when running at 210 rpm. The Pelton wheel develops 95.80 kW shaft power. The velocity of bucket is = 0.46 times the velocity of jet, overall efficiency=86% and coefficient of velocity is equal to 0.98. **[8]**

Q11)a) Derive the following equation of GVF with usual notations. State also the assumptions made for it. **[6]**

$$\frac{dy}{dx} = \frac{S_o - S_f}{1 - Fr^2}$$

b) A rectangular channel 8m wide carries a discharge of 11m^3/s (Manning's n = 0.025 and bed slope of 0.0016). Compute the length of back water profile created by a dam which backs up a depth of 2 m immediately behind the dam by direct step method. Take at least 3 steps to compute the profile. **[10]**

OR

Q12)a) Describe with neat sketches the following: **[10]**

i) Classification of channel bottom slopes

ii) Classification of water surface profiles

b) A rectangular channel 7.6 m wide has a uniform depth of flow of 2.1 m and has bed slope of 1 in 3000. If due to weir constructed at the downstream end of the channel, water surface at a section is raised by 0.76 m, determine the water surface slope with respect to horizontal at this section. Take Manning's n = 0.02. **[6]**