Total No. of Questions : 12]

SEAT No. : ____

P2394

[Total No. of Pages : 4

[5253]-105

T.E. (Civil) (End Semester)

FLUID MECHANICS - II

(2012 Pattern)

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

Instructions to the candidates:

1) ***Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10, Q11 or Q12.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
5) ***Assume suitable data, if necessary.***

Q1) a) What do meant by Drag? Explain in brief any one type of drag with neat sketch. **[2]**

b) The following data is related to the experiments conducted in a wind tunnel: **[6]**

i) Wind speed = 51 km/h

ii) Flat plate of size = (2 × 1) m

iii) Specific weight of air = 11.285 N/m^3

iv) Coefficient of lift = 0.76

v) Coefficient of drag = 0.16

Determine:

i) Lift,

ii) Drag,

iii) resultant force, and

iv) power exerted by the air stream on the plate.

OR

P.T.O.

Q2) a) Define unsteady flow. Give any two practical examples of it. **[2]**

b) Water flows through a 2.91 km long pipeline at velocity of 2.16 m/s when the valve at the end of the pipe is fully open and the head acting there is 29.7 m. The valve is desired to be closed fully in 16 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) Velocity distribution in open channel flow.

b) Classification of Flow in Channels.

OR

Q4) Explain in brief with neat sketches the following terms: **[6]**

a) Channel Transitions.

b) Specific Energy Curve.

Q5) An irrigation channel of trapezoidal section, having side slopes 3 horizontal to 2 vertical, is to carry a flow of 11 m^3/s on a longitudinal slope of 1 in 5000. The channel is to be lined for which the value of friction coefficient in Manning's formula is n = 0.012. Find the most economic section of the channel. **[6]**

OR

Q6) A horizontal rectangular channel 4 wide carries a discharge of 15 m^3/s. **[6]**

a) Determine whether a jump may occur at an initial depth of 0.5m or not.

b) If a jump occurs, determine the sequent depth to this initial depth.

c) Also determine the energy loss in the jump.

Q7) a) A jet of water 80 mm diameter having a velocity of 20 m/s, strikes normally a flat smooth plate.

Determine the thrust on the plate

i) if the plate at rest,

ii) if the plate is moving in the same direction as jet with a velocity of 6 m/s.

Also find the work done per second in each case and efficiency of the jet when the plate is moving. **[6]**

b) Explain the working of a Centrifugal pump with neat and labeled sketch. **[6]**

c) A centrifugal pump with l.25m diameter runs at 210 rpm and pumps 1890 lit/sec, the average lift being 6.lm. The angle which the vane makes at exit with the tangent to the impeller is 27º 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 6.1m, the inner diameter of the impeller being 0.6m. **[6]**

OR

Q8) a) Explain the following terms : **[6]**

i) Reciprocating pump

ii) Submersible pump

b) Explain in brief : **[6]**

i) Cavitation in centrifugal pump

ii) Various Efficiencies of centrifugal pump

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

Q9) a) Explain in brief various elements of hydroelectric power plant with the neat sketch. **[8]**

b) Draw the neat and labeled sketch of Francis turbine and explain the working of it. **[8]**

OR

Q10)a) Explain the following terms : **[8]**

i) "Performance Characteristic curves" of turbine.

ii) "Cavitations in turbines".

b) A Pelton wheel has to be designed for the following data : **[8]**
Power to be developed = 6000 kW,
Net head available = 310 m;
Speed = 560 r.p.m. ;
Ratio of jet diameter to wheel diameter = 1/10;
and overall efficiency = 85%.
Find the number of jets;
diameter of the jet;
diameter of the wheel;
and the quantity of water required.

Q11) a) Derive the following form of GVF equation. **[6]**

$$\frac{dy}{dx} = \frac{S_o - S_f}{1 - \frac{Q^2 T}{g A^3}}$$

b) A Rectangular channel 18 m wide carries water with a normal depth of 3.40m, bed slope 1 in 3700. A weir downstream rise the water depth to 4.90 m. Determine how far upstream of this section the depth of flow will be within 10% of normal depth. Use step method and take 2 steps, sketch and classify flow profile. Take Manning's N = 0.017. **[10]**

OR

Q12)a) Explain in detail the various types of water surface profiles. **[8]**

b) Describe the "Standard step method" related with GVF computation. **[8]**