Total No. of Questions : 12]

SEAT No. :

P2805

[Total No. of Pages : 4

[4958]-104
T.E.(Civil)
FLUID MECHANICS-II
(2008 Pattern) (301004)(Semester-I)

Time :3Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Solve Q 1 or Q 2, Q 3 or Q 4 ,Q 5 or Q 6 from section-I. Solve Q 7 or Q 8, Q9 or Q 10, Q 11 or Q 12 from section -II.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION-I

Q1) a) Define and discuss drag and lift phenomena. **[4]**

b) Discuss in detail about Magnus effect. **[8]**

c) An airplane having its span of 15m and chord of 2m flies with a velocity of 80m/s. Using the data given below determine the lift and drag forces involved.

Coefficient of lift = 0.85 Coefficient of drag = 0.06

Angle of attack = 6° $\rho = 0.8 kg/m^3$ **[6]**

OR

Q2) a) Define streamline body and bluff body. **[2]**

b) Discuss about water hammer in case of a pipe. **[2]**

c) With a neat sketch derive an expression for pressure growth due to gradual colsure of the valve in a pipe. **[6]**

d) An orifice is situated at the base of a hemispherical tank. Determine the time required to empty it when no flow is allowed into the tank. **[8]**

P.T.O.

Q3) a) In case of a jet striking at the center of the moving curved vane prove that for the maximum efficiency the velocity is one-third the jet velocity. **[8]**

b) A 8.0 cm dia. jet of water discharging at a rate of $0.2m^3$/sec strikes on a series of vanes tangentially. The vanes when stationary will deflect the jet through an angle of 120°. Calculate the magnitude and direction of the resultant force when the vanes are stationary. Additionally, determine the magnitude of resultant force, workdone per second on the vanes if they move in the direction of the jet at a velocity of 14m/sec. **[8]**

OR

Q4) a) Write notes on

i) Classification of centrifugal pumps **[4]**

ii) Net positive Suction Head(NPSH) **[4]**

b) The impeller of a centrifugal pump is of 25cm diameter and 5cm width at the periphery. It has blades whose tip angles incline backwards 55°from the radius. The impeller rotates at 1200rpm when it delivers a flow of $20m^3$/min. If the pump is designed to admit radially calculate

i) Direction and speed of water as it leaves the impeller

ii) Torque exerted by the impeller on water

iii) Shaft power required.

Assume mechanical efficiency=95%, hydraulic efficiency=75% **[8]**

Q5) a) With a neat sketch of hydroelectric power plant, briefly discuss all its elements. **[8]**

b) A jet of 100mm diameter when impinges on the buckets of a Pelton wheel, is deflected through an angle of 160° by the buckets. With the following data find

i) The force exerted by the jet on the buckets in tangential direction

ii) The power developed.

Head available =350m Coefficient of velocity=0.97 Speed ratio=0.48

Reduction in relative velocity while passing through buckets=15% **[8]**

OR

Q6) a) With a neat sketch write a note on draft tube considering following points

i) Its structure

ii) Its purposes

iii) Its types. **[4]**

b) Derive an expression of unit speed of turbine. **[4]**

c) In a hydroelectric generating plant, there are 4 similar turbines of total output 360MW. Each turbine is 85% efficient and runs at 120 rpm under a head of 70m. It is proposed to test the model of the above turbines in a flume where discharge is 400lit/sec under a head of 4m. Work out the scale ratio of the model. Also calculate the model speed and power results expected from the model. **[8]**

SECTION-II

Q7) a) Give the dimensions of Manning's roughness coefficient. Also state the factors affecting the roughness coefficient. **[6]**

b) What is hydraulically most efficient channel section? Derive condition for most efficient triangular section. **[6]**

c) Explain how the flow through open channel is different from that through a pipe. **[6]**

OR

Q8) a) Discuss about

i) Energy equation **[5]**

ii) Velocity distribution in open channel **[5]**

b) A 3.5m wide rectangular cannel conveys 15 cumec of water at a depth of 2.2m. Calculate

i) Specific energy

ii) Conjugate depth

iii) Critical depth

iv) Froude number.

State the type of flow. **[8]**

Q9) a) Define Froude's number. Give the flow classification based on Froude number. **[4]**

b) The width of a rectangular channel is 2.8m and carries a flow of 3 cumec discharge at a depth of 1.1m. A contraction of the channel width is proposed at a certain section. Find the smallest allowable contracted width that will not affect the u/s flow conditions. **[8]**

c) Describe about the types and uses of hydraulic jump. **[4]**

OR

Q10) a) A spillway has a width of 68m. If the tailwater depth is 4.5m and discharge over the spillway is 470cumec, determine the depth before jump, height and length of the jump. Also find the energy lost in the jump. **[8]**

b) Derive the conditions when the rectangular channel section is most economical. **[4]**

c) Define a hydraulic jump. State its engineering applications. **[4]**

Q11) a) Compare GVF and RVF. **[4]**

b) For a triangular channel with side slope 1: 1, longitudinal slope 1in 1600 and flow $0.4m^3$/sec, determine whether it is mild,steep or critical channel. **[6]**

c) With neat sketches discuss water surface profiles. **[6]**

OR

Q12) a) A rectangualr channel is 6m wide and has a uniform flow depth of 1.8m.It has a bed slope of 1 in 4000. If a weir is constructed at the d/s end of the channel, water surface at a specific section is raised by 0.75m. Determine the water surface slope with respect to horizontal at this section. Assume Manning's roughness coefficient as 0.02. **[8]**

b) Write short notes on

i) Graphical integration method. **[4]**

ii) Mild slope profiles **[4]**