Total No. of Questions : 12]

SEAT No. :

P1363

[Total No. of Pages : 4

[4858] - 104

T.E. (Civil) (Theory)

FLUID MECHANICS - II

(2008 Pattern) (Semester - I)

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

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, from Section - I Answer Q.7 or Q.8, Q.9 or Q.10, Q.11 or Q.12 from Section - II.***
2) ***Answer three questions from Section - I and three questions from Section - II.***
3) ***Answers to the two sections should be written in separate books.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Figures to the right indicate full marks.***
6) ***Assume suitable data, if necessary.***
7) ***Your answers will be valued as a whole.***
8) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***

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. **[4]**

Coefficient of lift = 0.85 Coefficient of drag = 0.06

Angle of attack = 6° ρ = 0.8 kg/m^3

d) Define streamline body and bluff body. **[2]**

OR

Q2) a) Discuss about water hammer in case of a pipe. State the factors affecting the pressure development due to water hammer. **[4]**

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

c) 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) For a centrifugal pump the impeller has diameter and width at the periphery 35cm and 6cm respectively. The tip angles of blades incline backwards 50º from the radius. The pump delivers 300lps of water with 1200 rpm rotations of impeller. Calculate **[8]**

i) speed and direction of water when it leaves the impeller

ii) torque exerted

iii) shaft power required. Assume

The pump is designed to admit radially

Hydraulic efficiency = 80% Mechanical efficiency = 95%

OR

Q4) a) Classify the centrifugal pump based on **[8]**

i) Specific speed ii) Working head

iii) Direction of flow of liquid iv) Number of entrances

b) A square plate weighing 150N with uniform thickness and 40 cm edge is hung. A horizontal jet of 2cm diameter impinges on the plate with a velocity of 20m/s. The centerline of the jet is 20 cm below the upper edge of the plate. The jet strikes the plate normally and at its center when the plate is vertical. Determine the force at the lower edge that is required to keep the plate vertical. Also determine the inclination to the vertical that the plate will assume under the action of jet. **[8]**

Q5) a) Write short notes on

i) Cavitation in turbines. **[4]**

ii) Model testing of hydraulic turbines. **[4]**

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) A Pelton wheel under a net head of 150m and at speed of 250rpm develops 6000kW. Determine **[8]**

i) The discharge

ii) Diameter of wheel

iii) Diameter and number of jets required

iv) Specific speed. Assume

Coefficient of velocity = 0.97

Hydraulic efficiency = 94%

Mechanical efficiency = 75%

Speed ratio = 0.48

Ratio of jet diameter to wheel diameter 1/9.

b) With a neat sketch write a note on draft tube considering following points **[4]**

i) Its structure

ii) Its purposes

iii) Its types

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

SECTION - II

Q7) a) Give the classification of flow in open channels. **[4]**

b) Explain how the flow through open channel is different from that through a pipe. **[4]**

c) A 3.5m wide rectangular channel conveys 15 cumec of water at a depth of 2.2m. Calculate : **[10]**

i) Specific energy ii) Conjugate depth

iii) Critical depth iv) Froude number.

State the type of flow.

OR

Q8) a) Define specific energy. With a neat sketch discuss specific energy curve. **[8]**

b) Determine dimensions of a most economical trapezoidal channel section to carry discharge of 20cumec. Assume bed slope 1:3000, Manning's N = 0.015. **[10]**

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

b) A hydraulic jump forms at the d/s end of spillway carrying 30 cumec discharge. If the depth before jump is 1.2m determine the depth after jump and energy loss. **[4]**

c) Write a note on venturiflume stating its use, structure etc. Differentiate between venturiflume and standing wave flume. **[8]**

OR

Q10) a) Define a hydraulic jump. State its engineering applications. **[4]**

b) The width of a rectangular channel is 3m and it carries a flow of 5 m^3/s at a depth of 1 .2m. A contraction of the channel width is proposed at a section. Find the smallest allowable contracted width that will not affect the u/s flow conditions. **[8]**

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

Q11) a) Write a note on assumptions made in the derivation of dynamic equation for GVF. **[4]**

b) State different methods developed for integrating the varied flow equation. Discuss any one of them. **[8]**

c) Compare GVF and RVF. **[4]**

OR

Q12) a) A rectangular 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. **[10]**

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

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