

Total No of Questions: [12]

SEAT NO. :

[Total No. of Pages : 3]

T.E. 2008 (Fluid Mechanics II)

(Semester - I)

Time: 3 Hours

Max. Marks : 100

Instructions to the candidates:

- 1) Answers to the two sections should be written in separate answer books.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Use of Calculator is allowed.
- 5) Assume Suitable data if necessary

SECTION I

- Q1) a) Define streamline body and bluff body. Give the classification of drag forces. [8]
 b) A kite of dimensions 0.85×0.85 m and weighing 6N is maintained in air at an angle of 9° to the horizontal. The string attached to kite makes an angle of 50° to the horizontal. If the drag and lift coefficients are 0.6 and 0.8 respectively, determine the wind speed and tension in the string. Density of air is 1.2 kg/m^3 . [10]

OR

- Q2) a) Discuss surge tank in relation with following points i) Purpose ii) Location iii) Types [6]
 b) Write a note on Magnus effect. [4]
 c) Derive an expression for the time required to empty a hemispherical tank through an orifice situated at the base of the tank. Consider no inflow into the tank. [8]
- Q3) a) In case of force on moving flat plate in the jet direction find the rate of work done. Also show that the efficiency is $2/V^3$. [8]
 b) A jet of 3cm in diameter having velocity of 25 m/sec strikes tangentially at one edge on a wheel that deflects the jet through an angle of 120° . What thrust will be developed on the vane when
 i) The axis of symmetry of the vane is horizontal
 ii) The tangent at the inlet tip is horizontal. [8]

OR

Q4)	a)	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 $20 \text{ m}^3/\text{min}$. 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]
	b)	Write notes on i) Classification of centrifugal pumps	[4]
		ii) Net positive Suction Head (NPSH)	[4]
Q5)	a)	Write short notes on i) Types of draft tube	[4]
		ii) Derivation for the unit speed of a turbine.	[4]
	b)	It is required to produce a total shaft output of 15MW by installing a number of single jet pelton wheels of specific speed 37. Determine the number of pelton wheels to be used and the jet diameter with the following related data: net available head=270m, wheel speed =600rpm, ratio of bucket to jet speed=0.4, overall efficiency of wheel=86%, for nozzle, $C_d=0.92$ and $K_v=0.97$	[8]
OR			
Q6)	a)	What is a reaction turbine? Give the detailed classification of reaction turbine.	[8]
	b)	An hydroelectric generating plant has 4 similar turbines of total output 260MW. Each turbine runs at 110 rpm under a head of 50m, and has an efficiency of 88%. If the model of these turbines is to be tested in a flume with discharge of 350lps under a head of 4.5m, determine the scale ratio of the model. Also calculate the model speed and power results expected from the model.	[8]
SECTION II			
Q7)	a)	Write a note on velocity distribution in open channel flow.	[6]
	b)	Explain how the flow through open channel is different from that through a pipe.	[6]
	c)	Design a most economical trapezoidal open channel with side slopes 2H: 1V and bed slope of 0.00059 to carry a discharge of 58 cumec. Assume Chezy's constant as 55.	[6]
OR			
Q8)	a)	A concrete lined channel of diameter 2.5m has a bed slope of 1 in 500. Determine the velocity and flow rate for the conditions of i) maximum velocity ii) maximum discharge. Assume $C=50$.	[10]
	b)	Explain in detail the continuity equation for open channel flow.	[8]

Q9)	a)	Define Froude Number. Give flow classification based on Froude's number.	[4]
	b)	Write in detail about specific energy diagram.	[4]
	c)	Water flowing in a channel has a discharge of 10 cumec. The channel width is 3.5m and side slope 1:1. The depth of flow is 1.2m. What is the specific energy of water? Determine the Froude number and comment on the type of flow.	[8]
OR			
Q10)	a)	i) Give the classification of hydraulic jump with their Froude number.	[4]
		ii) State the applications of hydraulic jump.	[4]
	b)	A spillway has a width of 68m. If the tailwater depth is 4.5m and discharge over the spillway is 470 cumec, determine the depth before jump, height and length of the jump. Also find the energy lost in the jump.	[8]
Q11)	a)	i) State the assumptions made in GVF.	[4]
		ii) Compare GVF and RVF.	[4]
	b)	Explain the step method for integrating the varied flow equation.	[8]
OR			
Q12)	a)	A rectangular channel is 8m wide. It has a bed slope of 0.00025 and a uniform depth of flow of 1.8m. A weir is constructed at the downstream end of the channel thereby water surface at a specific section is raised by 0.9m. What will be the water surface slope with respect to horizontal at this section? Consider Manning's roughness coefficient as 0.025.	[10]
	b)	State the assumptions made in the derivation of dynamic equation for GVF.	[6]