Total No. of Questions : 12]

SEAT No. : ____

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[5460]-105

T.E. (Civil)

FLUID MECHANICS - II

(2012 Pattern) (Semester-I) (301005) (End Semester)

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

Instructions to the candidates:

1) ***Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q. 7or Q.8, Q. 9 or Q. 10, Q. 11 or Q.12.***
2) ***Figures to right indicate full marks.***
3) ***Assume suitable data jf necessary.***

Q1) a) Explain one complete cycle of the water hammer phenomenon giving details of each stage. **[6]**

OR

Q2) a) A spherical balloon 2 m in diameter is filled with hydrogen and held stationary in air by anchoring it to the ground with the help of a string of negligible weight. The balloon is subjected to an upward force of 25 N. Determine the inclination of the string with the ground if the wind is flowing with a velocity of 18 km/hr. Also find the tension in the string. Take density of air = 1.2 kg/m^3 and Cd = 0.5. **[4]**

b) Distinguish between: Stream lined and bluff body. **[2]**

Q3) a) Derive the continuity equation for open channel flow. **[4]**

b) Explain the necessity of ventilation of suppressed weir. **[2]**

OR

Q4) a) In a 5.5 m wide rectangular channel, uniform flow takes place with a depth of 2.1 m. The channel bed slope is 0.0004 and Manning's n = 0.016. Determine the maximum width to which the channel can be constricted to obtain the critical flow condition at that section. **[6]**

Q5) a) Derive Chezy's formula. **[4]**

b) Define — i) conveyance, ii) section factor **[2]**

OR

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Q6) In hydraulic type energy dissipater the energy loss is 9 m and pre jump Froude Number 7.5. Determine the sequent depths and the rate of flow. What is the efficiency of the jump? **[6]**

Q7) a) Free jet impinging centrally on series of symmetric curved vane mounted on a wheel. For this case derive expressions for

i) force exerted by jet,

ii) work done per unit time,

iii) efficiency,

iv) condition for maximum efficiency. **[10]**

b) Explain —

i) Pumps in series,

ii) Pumps in parallel **[8]**

OR

Q8) a) A centrifugal pump running at 1150 rpm works against a total head of 85m. The external and internal diameters of the impeller are 550 mm and 275 mm, respectively. The width at outlet is 50 mm. The velocity of flow through the impeller is constant at 4 m/s. If the blade angle at outlet is 30°, determine

i) Vane angle at inlet,

ii) Work done by the impeller,

iii) manometric efficiency. **[9]**

b) A jet of water having a velocity of 40 m/s impinges without shock a series of vanes moving at 17 m/s, the direction of motion of the vanes being inclined at 23° to that of the jet. The relative velocity at outlet is 0.92 times of that at inlet, and the absolute velocity of the water at exit is to be normal to motion of the vanes. Find

i) Vane angles at inlet and outlet,

ii) Work done on vanes per unit weight of water supplied by the jet and

iii) Hydraulic efficiency. **[9]**

Q9) a) A Pelton wheel has to be designed for the following data. Power to be developed = 5000 kW. Net head available = 250 m, speed = 450 rpm, ratio of jet diameter to wheel diameter = 0.1, and overall efficiency = 85%. Find number of jets, diameter of the wheel, and quantity of water required, number of buckets. **[8]**

b) Derive expressions for unit quantities. Also explain the importance of these quantities. **[8]**

OR

Q10) a) Sketch a layout of typical hydroelectric power generation plant and explain in brief function of each element. **[8]**

b) A hydraulic turbine is to operate at 180 rpm under a head of 35 m. The discharge is 26 m^3/s and the overall efficiency is 85 %. Determine the speed, discharge, and output power when head is reduced to 15 m. **[6]**

c) Define specific speed. **[2]**

Q11)a) Derive differential equation for GVF. State the assumptions made. **[8]**

b) A wide rectangular channel carries a discharge of 4 $m^3/s/m$. The bed slope of the channel is 1:2400 and Manning's n = 0.09. At a certain section along this channel depth of flow is 2.5 m. How far upstream or downstream of this section the depth of flow will be within 10% of the normal depth ? Use direct step method. Use two steps only. **[10]**

OR

Q12)a) Write short notes on M_1, M_2 and M_3 profiles. State their practical examples. **[10]**

b) Explain the graphical method of integration of computation of GVF profile. **[8]**