Total No. of Questions :12]

SEAT No. :

P2540

[Total No. of Pages :3

[5153] - 505

T.E. (Civil)

FLUID MECHANICS - II

(2012 Pattern) (Semester - I) (End - Sem.)

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.7 or Q.8, Q.9 or Q.10, Q.11 or Q.12.***
2) ***Figures to the right indicate full marks.***
3) ***Assume suitable data if necessary.***

Q1) a) A circular disc of diameter 3 m is positioned normal to the direction of flow of wind at 24 m/s. If the coefficient of drag of the disc is 1.06, find the force required to hold it at rest. **[3]**

b) What are the factors that influence the total drag on the body? **[3]**

OR

Q2) Water is flowing through an elastic pipe of diameter 45 cm, thickness 5 mm and length 3500 m with a velocity of 2.2 m/s. A valve is provided at the end of the pipe. If the valve is suddenly closed, find the rise in pressure. Assume the Poisson's ratio as 0.25, the bulk modulus of water as 2×10^9 N/m^2 and the modulus of elasticity of pipe material 2×10^9 N/m^2. **[6]**

Q3) Derive the Chezy's formula for uniform flow in an open channel. List the factors that affect the Chezy's coefficient. **[6]**

OR

Q4) Explain in detail - specific energy diagram with neat sketch. **[6]**

P.T.O.

Q5) a) A hydraulic jump occurs in a wide rectangular channel. the discharge is 13 m^3/s and the prejump depth of flow is 0. 55 m. Find the postjump depth of flow. **[3]**

b) Define: **[3]**

i) normal depth

ii) conveyance

iii) section factor

OR

Q6) Determine the efficient section of a trapezoidal channel designed to carry 4.5 m^3/s of water. The side slopes of the channel are 1 horizontal to 3 vertical and the bed slope of the channel is 1 in 2000. Determine the optimum dimensions of the channel. Assume manning's coefficient n = 0.03. **[6]**

Q7) a) A jet of water having a velocity of 25 m/s impinging on a curved vane which is moving in the same direction as that of the jet with a velocity of 8 m/s. The jet makes an angle of 20^o with the direction of motion of vane at entry and leaves the vane at an angle of 120^o. if the water enters and leaves the vane without shock, find the vane angles at inlet and outlet. Also, find the work done per second per unti weight of water striking the vane. Neglect friction. **[10]**

b) Explain the following terms related to a centrifugal pump: **[8]**

i) Minimum starting speed

ii) Hydraulic losses

iii) Cavitation

iv) N.P.S.H.

OR

Q8) a) Derive an expression for force of jet impinging on a moving plate and compare it with force of jet when it strikes on a series of moving vanes. Also compare their efficiencies. **[9]**

b) The external and internal diameters of the impeller of a centrifugal pump are 600 mm and 300 mm respectively. The inlet and outlet vane angles are 30^o and 40^o respectively. The pump delivers 150 lit/s of water. If water enters at a velocity of 2 m/s radially, find the speed of impeller and the work done by the impeller. Assume velocity of flow remains constant throughout the impeller. **[9]**

Q9) a) Sketch a layout of typical hydroelectric power generation plant and explain in brief function of each element. **[8]**

b) Pelton turbine develops 10 MW under a head of 24 m and at a speed of 180 rpm and gives an efficiency of 82%. If a model $1/5^{th}$ the size of the prototype is tested under a head of 4 m, what must be its speed, power and discharge to run under similar condition? **[8]**

OR

Q10)a) A Pelton wheel with single jet rotates at 600 rpm. The pitch circle diameter of the wheel is 1.2 m and the buckets deflect the jet through an angle of 165^o. The net head on the wheel is 400 m and the discharge through nozzle is 0.4 m^3/s. Determine the power available at the nozzle, and hydraulic efficiency of the turbine. Take coefficient of velocity as 0.97.**[8]**

b) Explain main and operating characteristics of hydraulic turbine. **[8]**

Q11)a) Derive the differential equation for gradually varied open channel flow. State the assumptions made. **[8]**

b) A Rectangular channel 15 m wide carries water with a normal depth of 3.2 m, bed slope 1 in 3550. A weir downstream rise the water depth to 5.00 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 = 0.016. **[10]**

OR

Q12)a) Classify the channel bed slopes and show various zones. **[9]**

b) Explain graphical integration method of gradually varied flow computation. **[9]**

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