Total No. of Questions :12]

SEAT No. :

P2832

[Total No. of Pages :4

[4958] - 1004

T. E. (Civil)

FLUID MECHANICS - II

(2012 Course) (301005) (Semester - I)

Time : 2½ Hours] *[Max. Marks :70*

Instructions to the candidates:

1) ***Answer Q. No.1 or 2, 3 or 4, 5 or 6, 7 or 8, 9 or 10, 11 or 12.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
5) ***Assume suitable data, if necessary.***

Q1) a) What is wake formation in flow around submerged bodies & why is wake developed? What is the affect of wake on the body & different methods to reduce wake formation. **[4]**

b) A submarine is moving in sea water of density 1030 kg/m^3 at a velocity of 12 km/hr. The periscope of submarine is 10 cm in diameter. Find the frequency of vortex shedding & the force per metre length of periscope. Find, also the Strouhl's No. Assume C_D for periscope $= 0.25$, kinematic viscosity $= 1.25 \times 10^{-6} m^2/s$. **[4]**

OR

Q2) a) Briefly discuss the effect of time of closure of valve on the rise of pressure in a pipe line. What is the best method to avoid water hammer effect in pipe lines. **[4]**

b) Derive the expression for celerity of elastic wave through flow medium. **[4]**

P.T.O.

Q3) a) Briefly explain the velocity distribution in open channel. What is the effect of shape & surface roughness on velocity distribution in open channel. **[3]**

b) A trapezoidal channel has a bottom width of 10 m & side slopes of 2 horizontal to 3 vertical. If the depth of flow is 4.5 m & Chezy's C = 55, find the discharge. Assume the bed slope of channel as 1 in 4000. **[3]**

OR

Q4) a) What are the various conditions for critical flow to occur in open channel? Explain the methods to calculate the critical depth for an trapezoidal channel section. **[3]**

b) A water channel is V shaped, each side making an angle of 45° with vertical. Calculate the discharge when depth of water is 0.3 m & bed slope is 1 in 500.Take C = 50. **[3]**

Q5) a) A Rectangular channel is 4.0m wide & carries a discharge of 3.2 m^3/s with a depth of flow 0.8 m. If Manning N = 0.016 find

i) Specific Energy

ii) Specific force

iii) Bed slope **[3]**

b) Derive the conditions for most efficient or economical triangular channel section. **[3]**

OR

Q6) a) What are the various assumption in the analysis of hydraulic jump? **[2]**

b) At the toe of an hydraulic jump the Froude No & depth of flow are 9 & 0.3 m respectively. Estimate the specific energy head at the heel of jump. **[4]**

Q7) a) Derive the equation for force, workdone, & maximum efficiency developed by a jet of water on a series of flat plates fixed on the periphery of wheel. **[8]**

b) A discharge of 0.01m^3/s moves out of a nozzle at a velocity of 25 m/s & strikes at one tip of a curved vane such that it is deflected through an angle of 120°. Find **[8]**

i) Force exerted & work done by jet on vane in the direction of motion, when plate is fixed.

ii) Work done when vane moves with velocity of 10m/s.

iii) Work done & maximum efficiency on a series of vane.

OR

Q8) a) Compare centrifugal & Reciprocating pump. What are the different types of casing for a centrifugal pump & explain any one with neat sketch. **[4]**

b) What is multistage certrifugal pump & explain **[4]**

i) Impeller in series &

ii) Impeller in parallel

c) The impeller of an centrifugal pump running at 1000 rpm against a head of 15m. It has a diameter of 30 cm, width of 5 cm & vane angle, at exit of 30°. Find **[8]**

i) Absolute velocity of water at outlet.

ii) Velocity of flow at outlet

iii) Angle of absolute velocity at outlet

iv) Discharge developed by pump

Q9) a) Explain the working principle of an impulse turbine. Explain with example the classification of turbine based on **[8]**

i) Specific speed

ii) Head on turbine

iii) Action of water

iv) Direction of flow of water

b) A Pelton wheel runs at 450 rpm under an effective head of 175m. The ratio of nozzle diameter to pitch circle diameter is $\frac{1}{10}$. Assuming overall efficiency of 85%, determine **[8]**

i) Size of wheel

ii) Size of jet

iii) Discharge of water required

iv) Power developed

OR

Q10)a) For an inward flow reaction turbine, draw inlet & outlet velocity triangle & derive the condition for maximum efficency of turbine. **[6]**

b) What are unit & specific quantity? Derive the expression for **[4]**
   i) Unit discharge
   ii) Unit power of a turbine.

c) A turbine having an efficiency of 85% runs at 350 rpm at an head of 20m. If the discharge through turbine is $12m^3/s$ find **[6]**
   i) Power developed
   ii) Specific speed
   iii) Type of turbine
   iv) Performance under a head of 15 m.

Q11)a) State the assumption made in the analysis of gradually varied flow. What is the concept of wide rectangular channel. Derive the dynamic equation for wide rectangular channel using Manning & Chezy formula. **[8]**

b) What is the criteria for classification of channel slope, and list out the various possible types of channel slope. **[4]**

c) Draw the flow profile in the following giving the governing equation for developing the profile. **[6]**
   i) Zone 3 on adverse slope
   ii) Zone 2 on horizontal slope
   iii) Zone 3 on vertical slope

OR

Q12)a) What is control section? Discuss the location of control section with Froude No. **[4]**

b) What are the various methods for finding the length of flow profile? Explain graphical integration method & any one method of direct integration method of finding the length of flow profile. **[6]**

c) A discharge of $20m^3/s$ flows through a rectangular channel of 10 m width and a bed slope of 1 in 4000. At a particular section the depth of flow is 1.2m. Determine how far U/S or D/S the depth of will be 1.8m. Take Manning N = 0.02. Use step method & take 2 steps. **[8]**