

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/m³ 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 = $1.25 \times 10^{-6} \text{m}^2/\text{s}$. **[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 $3.2 \text{ m}^3/\text{s}$ with a depth of flow 0.8 m. If Manning $N = 0.016$ find
- Specific Energy
 - Specific force
 - 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 $0.01\text{m}^3/\text{s}$ 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]
- Force exerted & work done by jet on vane in the direction of motion, when plate is fixed.
 - Work done when vane moves with velocity of 10m/s .
 - 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 centrifugal pump & explain [4]
- Impeller in series &
 - 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]
- Absolute velocity of water at outlet.
 - Velocity of flow at outlet
 - Angle of absolute velocity at outlet
 - Discharge developed by pump
- Q9)** a) Explain the working principle of an impulse turbine. Explain with example the classification of turbine based on [8]
- Specific speed
 - Head on turbine
 - Action of water
 - 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]
- Size of wheel
 - Size of jet
 - Discharge of water required
 - Power developed

OR

- Q10)a)** For an inward flow reaction turbine, draw inlet & outlet velocity triangle & derive the condition for maximum efficiency of turbine. [6]
- b) What are unit & specific quantity? Derive the expression for [4]
- Unit discharge
 - 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 $12\text{m}^3/\text{s}$ find [6]
- Power developed
 - Specific speed
 - Type of turbine
 - 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]
- Zone 3 on adverse slope
 - Zone 2 on horizontal slope
 - 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 $20\text{m}^3/\text{s}$ 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]

