Total No. of Questions : 12]

P1295

SEAT No. :

[Total No. of Pages : 4

[4858] - 1004

T.E. (Civil) (Semester - I)

FLUID MECHANICS - II

(2012 Pattern) (End Semester)

Time : 3 Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answer 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) ***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) Draw the neat sketch of an unsymmetrical and symmetrical Airfoil. Also explain the following things related to an Airfoil, **[4]**

i) Chord line

ii) Angle of attack

iii) Stall

iv) Camber

b) Explain "water Hammer in pipes" w.r.t. **[4]**

i) Gradual closure of valve

ii) Instantaneous closure of valve

OR

Q2) a) In a pipe 600mm diameter and 3000 m length, provided with a valve at its end, water is flowing with a velocity of 2m/s. Assuming velocity of pressure wave c = 1500m/s, find: **[4]**

i) The rise in pressure if the valve is closed in 20 seconds

ii) The rise in pressure if the volve is closed in 2.5 seconds.

Assume the pipe to be rigid one and take bulk modulus of water as 2 GN/m^2.

b) Assuming the cross-sectional area of a passenger car to be $2.7m^2$ with a drog co-efficient of 0.6, estimate the energy requirement at a speed of 60km/h. Assume the weight of car to be 30KN and co-efficient of friction 0.012. Assume ρ to be 1.208 kg/m^3. **[4]**

P.T.O.

Q3) a) Explain with neat sketch 'Geometric elements of channel: **[3]**

b) A 8m wide channel conveys $15m^3/s$ of water at a depth of 1.2m. Calculate: Critical depth, critical velocity and minimum specific energy. **[3]**

OR

Q4) a) During an experiment in a laboratory, $0.05m^3$ of water flowing over a right-angled notch was collected in one minute. If the head of the sill is 50mm, calculate the co-efficient of discharge of the notch. **[3]**

b) Explain in brief : **[3]**

i) Froude's number

ii) Section factor

iii) Hydraulic exponent

Q5) a) Differentiate between open channel (flow) and pipe flow **[3]**

b) Describe the classification of hydraulic jump. **[3]**

OR

Q6) a) Show that in case of most economical rectangular channel section: **[3]**

i) The depth of flow is equal to half the base width

ii) Hydraulic radius is equal to half the depth of flow

b) Explain "Practical uses of hydraulic jump". **[3]**

Q7) a) A jet of water of diameter 10cm strikes a flat plate normally with a velocity of 15m/s. The plate is moving with a velocity of 6m/s in the direction of the jet and away from the jet. Find: **[8]**

i) The force exerted by the jet on the plate

ii) Work done by the jet on the plate per second

iii) The power of the jet in kW

iv) Efficiency of the jet

b) A centrifugal pump delivers water against a net head of 14.5 meters and a design speed of 1000 r.p.m. The vanes are curved back to an angle of 30^o with the periphery. The impeller diameter is 300mm and outlet width is 50mm. Determine the discharge of the pump if manometric efficiency is 95%. **[8]**

OR

Q8) a) A centrifugal pump having outer diameter equal to two times the inner diameter and running at 1000 r.p.m works against a total head of 40m. The velocity of flow through the impeller is constant and equal to 2.5 m/sThe vanes are set back at on angle of 40^{o} at outlet. If the outer diameter of the impeller is 500mm and width at outlet is 50mm, determine **[8]**

i) Vane angle at inlet,

ii) Work done by impeller on water per second and

iii) Manometric efficiency

b) Derive the expression for workdone per second by the jet on the inclined plate moving in the direction of the jet. **[8]**

Q9) a) Explain the following efficiencies of a turbine: **[8]**

i) Hydraulic efficiency (η_h)

ii) Mechanical efficiency(η_m)

iii) Volumetric efficiency (η_v)

iv) Overall efficiency (η_o)

b) What do you mean by "Unit Quantities"? Explain the following w.r.t. unit quantities **[8]**

i) Unit speed

ii) Unit discharge

iii) Unit power

OR

Q10)a) A turbine is to operate under a head of 25m at 200r.p.m. The dischange is 9 cumec. If the efficiency is 90% determine the performance of the turbine under a head of 20 meters. **[8]**

b) The penstock supplies water from a reservoir to the pelton wheel with a gross head of 500m. One third of the gross head is lost in friction in the penstock. The rate of flow of water through the nozzle fitted at the end of the penstock is 2.0 m^3/s. The angle of deflection of jet is 165^{o}. Determine the power given by the water to the runner and also hydraulic efficiency of the pelton wheel, Take speed ratio = 0.45 and Cv = 1.0. **[8]**

Q11)a) Derive with usual notatations "Dynamic equation of G.V.F. in its differential form". **[10]**

Also state assumptions for it

b) What do you mean by "GVF computations"?

Enlist various methods of GVF computations and explain any one method in detail. **[8]**

OR

Q12)a) Explain with neat sketches "Classification of channel bottom slopes". **[8]**

b) Consider a trapezoidal channel of 4.0m bottom width with side slopes of 1:1. If it carries a discharge of 2.485 m^3/s with mannings 'n' of 0.02, determine the distance required to change the flow depth from 0.9m to 0.5m, using step method, classify the surface profile. **[10]**