Total No. of Questions : 12]

SEAT No. :

P2362

[Total No. of Pages : 4

[4758]-504

T.E. (Civil)

FLUID MECHANICS - II

(2012 Course) (End - Sem.) (301005) (Semester - I)

Time : 2 ½ Hours] *[Max. Marks :70*

Instructions to the candidates:

1) ***Answer Q.No.1 or 2, Q.No.3 or 4, Q.No.5 or 6, Q.No.7 or 8, Q.No.9 or 10, Q.No. 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) Define: **[2]**

i) Drag force

ii) Lift force

b) Experiments were conducted in a wind tunnel with a wind speed of 51 km/hr on a flat plate of size 2.1m long and 1.1m wide. The density of air is 1.15 kg/m^3. The coefficients of lift and drag are 0.76 and 0.16 respectively. Determine: **[6]**

i) The lift force

ii) The drag force

iii) The resultant force

iv) Direction of resultant force

v) Power exerted by air on the plate.

OR

P.T.O.

Q2) a) Explain in brief

i) Water Hammer **[2]**

ii) Unsteady flow **[2]**

b) A valve is provided at the end of a cast iron pipe of diameter 160mm and of thickness 12mm. The water is flowing through the pipe, which is suddenly stopped by closing the valve. Find the maximum velocity of water, when the rise of pressure due to sudden closure of valve is 198.2 N/cm^2. Take K for water as 19.62 x 10^4 N/cm^2 and E for cast iron pipe as 11.772 x10^6 N/cm^2. **[4]**

Q3) Explain in brief:

a) Channel transitions. **[3]**

b) Froude number and classification of channel flow based on it. **[3]**

OR

Q4) Derive the expression "$Q = \frac{8}{15}.Cd.\sqrt{2g}.\tan\left(\frac{\theta}{2}\right).H^{5/2}$" for flow over right angled triangular notch. **[6]**

Q5) The depth of flow of water, at a certain section of a rectangular channel of 2.1m wide is 0.35m. The discharge through the channel is 1.6 m^3/s. Determine, whether a hydraulic jump will occur, and if so, find its height and loss of energy per kg of water. **[6]**

OR

Q6) Prove that with usual notations for most economical trapezoidal channel section half of top width equal to one of sloping sides of the channel. **[6]**

Q7) a) Explain the working of centrifugal pump with neat sketch. **[6]**

b) Derive the expression for the "work done by the jet" in case of flat plate inclined and moving in the direction of jet. **[6]**

c) Derive the expression for "minimum speed for starting a centrifugal pump". **[6]**

OR

Q8) a) A centrifugal pump delivers water against a net head of 14.5m and design speed of 1000 rpm, the vanes are curved back to an angle of 30^{o} with the periphery. The impeller diameter is 30 cm and width at outlet is 5 cm. Determine the discharge of pump if manometric efficiency is 95%. **[6]**

b) A jet of water of diameter 7.5cm strikes a curved plate at it's centre with a velocity of 20m/s. The curved plate is moving with a velocity of 8m/s in the direction of jet. The jet is deflected through an angle of 165^{o}. Assume the plate is smooth. Find **[6]**

i) Force exerted on the plate in the direction of jet.

ii) Power of the jet.

iii) Efficiency of the jet.

c) Explain in brief: **[6]**

i) Reciprocating pump.

ii) Submersible pump.

Q9) a) Explain: **[4x2=8]**

i) Hydraulic efficiency(η_h)

ii) Mechanical efficiency(η_m)

iii) Volumetric efficiency(η_v)

iv) Overall efficiency(η_o)

b) A Turbine is to operate under a head of 25 m and at 200 r.p.m. The discharge is 9 cumec and if the overall efficiency is 90% determine: **[8]**

i) Power generated (kW)

ii) Specific speed of machine.

iii) Type of turbine.

OR

Q10)a) A francies turbine with an overall efficiency of 75% is required to produce 148.25 kW power. It is working under head of 7.62m. The peripheral velocity = $0.26\sqrt{2gH}$ and the radial velocity of flow at inlet is $0.96\sqrt{2gH}$. The wheel runs at 150 r.p.m. and the hydraulic losses in the turbine are 22% of the available energy. Assuming radial discharge, determine: **[8]**

i) The guide blade angle

ii) The wheel vane angle at inlet

iii) Diameter of wheel at inlet.

iv) Width of wheel at inlet

b) Explain **[4+4]**

i) Cavitation in turbine

ii) Governing of turbine

Q11)a) Derive the dynamic equation of G.V.F. with usual notations. **[8]**

b) Explain Ven Tee Chow method for computation of G.V.F. **[8]**

OR

Q12)a) Explain in detail the various types of water surface profiles. **[6]**

b) A rectangular channel 10m wide carries a discharge of 30 m^3/s. It is laid at slope of 0.0001. If at a section in this channel the depth is 1.6m, how far (U/s or D/s) from the section will the depth be 2.0m? Take Manning's n=0.015. Use step method of integration. **[10]**

EEE