IES GROUP OF INSTITUTION BHOPAL

Civil Engineering Branch

BE Fifth Semester

F.M.-2(CE-503)

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UNIT-1

Q1. A smooth pipe of diameter 400mm and length 800m carries water at the rate of 0.04m/s .Determine lost due to friction,wall shearv centre-line velocity and thickness of laminar sub-layer.take the kinematic viscosity ofv water as 0.018 stokes.

Q2.A smooth two –dimensional flat plate is exposed to a wind velocity of 360km/hr. if the laminar boundary layer exist.up to a value of Re =2 x 10^5 find the maximum distance from the leading edge upto which laminar layer exists and the maximum boundary layer thickness .The kinematic viscosity of air is 1.49 x10^{-5} m^2/sec. density of air =1.2kg/m^3.

Q3Find the head loss due to friction in pipe of diameter 250 mm and length 60m, through which water is flowing at a velocity of 3.0m/s using (i)Darcy formula and (ii)Chezy's formula for which C=55. Take v for water =.01 stoke.

Q4Derive an expression for a minor loss due to sudden contraction in the pipe flow analysis .

Q5Obtain an expression for head loss due to sudden expansion of pipe.

UNIT-2

Q1 Discharge through open channel By Chezy's formula.

Q2 A flow of water of 100 litres per second flows down in a rectangular flume of width 600mm and having adjustable bottom slope.if chezy's constant C is 56 find the bottom slope necessary for uniform flow with a depth of flow of 300mm also find conueyance k of the flume.

Q3 A trapezoidal channel has side slopes of 1 horizontal to 2 vertical and the slope of the bed is 1 in 1500. The area of the section is 40 m2 .find the dimensions of the section if it is most economical. Determine the discharge of the most economical section if C=50.

Q4 Calculate the flow rate and the conveyance for a rectangular channel 5m wide for uniform flow at a depth of 2m. the bed slope of the channel is 1 in 1000. Take Chezy'constsnt C=50. Also determine the type of flow.

Q5 Find the discharge through a circular pipe of diameter 3.0m if the depth of water in the pipe is 1.0 m and the pipe is a slope of 1 in 1000 Take value of Chezy's constant as 70.

UNIT-3

Q1Starting from first principal derive the dynamic equation of gradually varied flow.Also state the dynamic equation of gradually varied.Also state the assumptions made in this analysis.

Q2Discuss various causes of formation of back water curve also derive the expression for the length of back water curve.

Q3A hydraulic jump occurs in a 0.6 m wide rectangular channel at a point where depth of water flow is 0.20 m and the Froude number is 2.5 Calculate the specific energy,critical depth, loss of head and the energy dissipated.

Q4Water is discharged in a rectangular channel 1.2 m wide by passing under a sluice so that flow is 0.85 m^3/s and the depth 0.60 m.Examine how the depth will vary downstream if the slop of the channel bed is (i)1:1000 (ii)1:700 (iii) 1:500
Assuming C=57.

Q5A rectangular channel has a width of 1.8 m and carries a discharge at 1.8 m^3/s at a depth of 0.20m. Calculate –
(i)The specific energy
(ii)Depth alternate to the existing depth
(iii)Froude number at the alternate depths.

UNIT-4

Q1 What are the coefficients of drag and lift ? Show that these are dependent on Reynold's number and characteristic area of the body immersed in a fluid.

Q2Aflat plate 1.5m x 1.5m moves at 50 km/hour in stationary air of density 1.15 kg/m^3. If the co-efficients of drag and lift are 0.15 and 0.75 respectively,determine:
(i)The lift force
(ii)The resultant force and
(iii)The power required to keep the plate in motion.
(iv)The drag force,

Q3A man weighing 90kgf descends to the ground from an aeroplane with the help of a parachute against the resistance of air.The velocity with with which the parachute ,which is hemispherical in shape , comes down is 20m/s Find the diameter of the parachute.Assume C_D=0.5 density of air =1.25kg/m^3

Q4A kite 0.8m x 0.8m weighing 0.4 kgf(3.924) assumes an angle of 20^o to the horizontal The string attached to the kite makes an angle of 45^o to the horizontal the pull on the string is 2.5kgf (24.525) when the wind is flowing at speed of 30km/ hour Find the corresponding co-efficient of drag and lift .Density of air is given as 1.25kg/m^3

Q5Calculate the weight of a ball of diameter 80 mm which is just aupported in a vertical air stream which is flowing at a velocity of 7m/s .the density of air is given as 1.25kg/m^3. Kinematic viscosity of air =1.5 stokes.

UNIT-5

Q.1 A Centrifugal pump having a overall efficiency 70 percent , delivers 0303 mt. cu. Per sec of water to a height 20 m through a 10 cm dia. pipe 70 m long taking friction coefficient 0.01 . calculate the power required to run the pump .

Q.2 Two jet strike at buckets of a pelton wheel which is having a horse power as 15 MW , the dia. Of each jet is 15 cm , if the net head on turbine is 500 m . find overall efficiency of turbine , assume $C_v = 1.0$

Q.3 A Frances turbine has to be designed to develop 367.5 KW under a head of 70 m, while running at a speed of 750 RPM ratio of width of runner to dia. At runner is 0.1 outer dia. Of runner is half of the inner dia. Of runner flow ration is 0.15 , hydraulic efficiency 95 % and mechanical efficiency 84 % , four % of the circumferential area of runner to be occupied by the thickness of vanes . assume velocity of flow is constant and discharge is radial at outlet , calculate

(1) Dia. Of wheel

(2) The quantity of water

Q.4 A centrifugal pump delivers water against a net head of 14.5 mt. and a design speed of 1000 RPM the vanes are curved back to an angle of 30^0 with the periphery . the impeller dia. Is 300 mm and outlet width 50 mm . determine the discharge of the pump if manometric efficiency is 95 % .

Q.5 A Pelton wheel is having a mean bucket dia. Of 1 m , and running at 1000 RPM , the net head on the pelton wheel is 700 m if the side clearance angle is 15^0 and discharge through nozzle is 0.1 mt. cu. Per sec , find

(1)The power available at the nozzle .

(2) Hydraulic efficiency of the turbine