Extra

SE(CIVIL) | SEM IV | SH-22 | R-19 | 19-12-22

Duration-3hrs **Marks-80**

QP CODE: 100|6315

N.B. 1) Question No.1 is Compulsory.

2) Attempt any three questions from remaining questions.

3) Assume suitable data where required and clearly state the same.

4) Figures to the right indicate full marks.

Q.1 Attempt any four. **(20)**

a) Obtain expression for head loss in a sudden expansion in the pipe.

b) Explain the terms distorted and undistorted models.

c) Discuss the phenomenon of boundary layer separation in diverging flow.

d) Explain Dash-Pot mechanism in laminar flow.

e) Compare hydrodynamically smooth and rough pipes.

f) Explain moment of momentum equation.

Q.2a) for the distribution main of a city water supply a 30 cm main is required. As pipes above 25cm diameter are not available. It is decided to lay two parallel mains of same diameter. Find the diameter of the parallel main. **(10)**

b) What is meant by water hammer? Obtain an expression for the rise in pressure in a thin elastic pipe of circular section in which the flow of water is stopped by sudden closure of value. **(10)**

Q.3a) Explain in detail Hardy cross method for pipe network. **(10)**

b)An aeroplane travels in air of pressure 1 bar of 10° c at a speed of 1700 km/hr. find the Mach number and Mach angle take K= 1.4 & R = 287 J/kg.k. **(10)**

Q.4 a) for the following types of velocity distribution obtain the values of (δ^*/δ) and (Θ/δ)

i) $\frac{v}{V}=2\eta-\eta^2$ ii) $\frac{v}{V}=2\eta-2\eta^2+\eta^4$ where $\eta = (y/\delta)$. **(10)**

b) Two parallel plates kept 10cm a part have laminar flow of oil between them with a maximum velocity of 1.5mlsec. Calculate the discharge per meter width the shear stress at the plates, the difference in pressure in kg/cm^2 between two points 20 m apart, the velocity gradient at the plates and velocity 2 cm from the plate. Take viscosity of oil to be 0.25 kg sec /m^2. **(10)**

Q.5 a) 250 litres of water is flowing in a pipe having a diameter of 300mm. If the pipe is bend by135^0.Find the magnitude and direction of the resultant force on the bend. The pressure of water flowing is 400 KN/m^2. Take w = 9.81 KN/m^3. **(10)**

b) A crude oil of viscosity 0.97 poise and relative density is 0.9 flowing through a horizontal circular pipe of diameter 100 mm and oil length 10m. Calculate the difference of pressure at the two ends of the pipe. If 100 kg of the oil is collected in a tank in 30 seconds. **(10)**

Q.6 a) Derive Prandtl's Universal velocity distribution equation for turbulent flow in pipes what do you understand velocity defects. **(10)**

b) The pressure difference Δp in a pipe of diameter D and the length l due to turbulent flow depends on the velocity Viscosity density ρ and roughness K using Buckingham's π theorem obtain an expression for Δp. **(10)**

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