CENTRAL INSTITUTE OF TECHNOLOGY, KOKRAJHAR
(Deemed to be University)
KOKRAJHAR :: B.T.A.D. :: ASSAM :: 783370

END – SEMESTER EXAMINATION
DIPLOMA

Session: **Jan-Jun, 2025** Semester: **4th** Time: **3Hrs** Full Marks: **100**
Course Code: **DCE 403** Course Title: **Fluid Mechanics**

ANSWER any 5 questions:

Q1. a) Obtain an expression for continuity equation for a three-dimensional flow. A 40 cm diameter pipe, conveying water, branches into two pipes of diameters 20 cm and 10 cm respectively. If the average velocity in the 40 cm diameter is 3 m/s. Find the discharge in this pipe. Also determine the velocity in 10 cm pipe if the average velocity in 20 cm diameter pipe is 2 m/s **(14)**

b) State Bernoulli's theorem for steady flow of an incompressible fluid. Write down the expression for Bernoulli's equation **(06)**

Q2. a) Water is flowing through a pipe having diameter 40 cm and 20 cm at the cross sections 1 and 2 respectively. If the velocity at section 1 is 5.0 m/s. Determine the velocity head at section 1 and 2 and also rate of discharge **(06)**

b) The velocity vector in a fluid flow is given by xy2i-2yz2j-(y2z- 2z3/3) k, find the velocity and acceleration of a fluid at (1,2,3) at t=1 **(14)**

Q3. a) Explain various types of energy losses through pipe. **(10)**

b) Find the head loss when a pipe of diameter 300 mm suddenly enlarged to a diameter of 400 mm. the rate of flow through the pipe is 250litres/s **(5)**

c) Find the head loss due to friction in pipe of diameter 200mm and length 40 m, through which water is flowing at a velocity of 2m/s using Darcy's formula. Take f as 0.0025 **(5)**

Q4. a) Derive the expression for the discharge through a venturi meter. Determine the rate of flow if a horizontal venturi meter with inlet and throat diameters 20 cm and 10 cm is used to measure the flow of water. The reading of differential manometer connected to inlet and throat is 20 cm of mercury. Take Cd = 0.98. **(12)**

b) Define the terms hydraulic gradient line and total energy, major energy loss and minor energy loss. **(8)**

Q5.a) List the different types of forces present in a fluid flow. Which all forces are considered for Euler's equation of motion **(08)**

b) The head of water over the centre of an orifice of diameter 20 mm is 1m. The actual discharge through the orifice is 0.85litres/s. find the coefficient of discharge. **(04)**

c) How will you determine the velocity at any point with the help of pitot tube A pitot tube placed in the centre of a 200mm pipe line has one orifice pointing upstream and other perpendicular to it. The mean velocity in the pipe is 0.60 of the central velocity. Find the discharge through the pipe if the pressure difference between the two orifice is 40 mm of water. Take cv as 0.98 **(08)**

Q6.a) Define venturi meter and pitot tube. **(06)**

b) Determine the rate of flow of water through a pipe of diameter 20 cm and length 50 m when one end of the pipe is connected to a tank and the other end of the pipe is open to the atmosphere. The pipe is horizontal and the height of water in the tank is 4 m above the centre of pipe consider all minor losses and take f as 0.036 **(08)**

c) How will you determine the loss of head due to friction in pipes using i) Darcy's formula ii) Chezy's formula? **(06)**