Diploma/4th/DCE 403

2024

Fluid Mechanics

Full Marks: 100

Time: Three hours

The figures in the margin indicate full marks for the questions.

*Answer **any five** questions.*

1.	a)	What is Euler's equation of motion? Derive Bernoulli's equation from Euler's equation of motion.	12
	b)	What is orifice meter? Classify different types of orifices. The head of water over an orifice of diameter 40 mm is 10 m. find the actual discharge and actual velocity of jet at vena- contracta. Take $C_d = 0.6$ and $C_v = 0.98$	08
2.	a)	State Bernoulli's theorem for steady flow of an incompressible fluid. What are the assumptions made in the derivation of Bernoulli's equation?	10
	b)	Define venturimeter? Note down the expression for determine the rate of flow through venturimeter?	05
	c)	What are the different types of forces present in a fluid flow? For the Euler's equation of motion which forces are taken into consideration?	05
3.	a)	The water is flowing through a pipe having diameters 30 cm and 15 cm at the bottom end and upper end respectively. The rate of flow through pipe is 50 litres/sec. If the pressure at bottom end is 29.43N/cm², find the intensity of pressure at upper end is 14.715N/cm². Determine the difference in datum head.	08
	b)	A horizontal venturimeter with inlet and throat diameters 30 cm and 15 cm respectively is used to measure the flow of water. The reading of differential manometer connected to the inlet and the throat is 20 cm of mercury. Determine the rate of flow take $c_d = 0.98$.	08
	c)	How will you determine the loss of head due to friction in pipes by using i) Darcy's formula ii) Chezy's formula?	04
4.	a)	What is the difference between Pitot tube and pitot static tube	06
	b)	Find the loss of head when a pipe of diameter 200mm is suddenly enlarged to a diameter of 400mm. the rate of flow of water through the pipe is 250 litres/second	06
	c)	What is a pitot-tube? Find the velocity of the flow of an oil through a pipe, when the difference of mercury level in a differential U- tube manometer connected to	08

the two tapings of the pitot tube is 100mm. take co-efficient of pitot as 0.98 and specific gravity of oil as 0.8.

5. a) An orifice meter with orifice diameter 10 cm is inserted in a pipe of 20 cm diameter. The pressure gauges fitted upstream and downstream of the orifice meter gives reading of $19.62 N/cm^2$ and $9.81 N/cm^2$ respectively. Coefficient of discharge for the orifice meter is given as 0.6. find the discharge of water through pipe   08

   b) Define continuity equation. Obtain an expression for continuity equation for a 3-dimensional flow   12

6. a) Find the head loss due to friction in pipe of diameter 300mm and length 50 m, through which water is flowing at a velocity of 3m/s using Darcy's formula. Take f as 0.00256   04

   b) Define the term major energy loss and minor energy loss. Explain various types of energy losses through pipe   10

   c) Define the following coefficient i) coefficient of velocity ii) coefficient of discharge iii) co efficient of contraction   06