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Question Paper Code : 51245

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2016

Third Semester

Civil Engineering

CE 2202/080100015/10111 CE 305/CE 1203/CE 35 – MECHANICS OF FLUIDS

(Regulations 2008/2010)

Time : Three Hours **Maximum : 100 Marks**

Any missing data can be suitably assumed with proper justification.

Answer ALL questions.

PART – A (10 × 2 = 20 Marks)

1. Brief on bulk modulus.
2. Distinguish between vapour and gas.
3. With the help of a sketch, show the relationship between absolute pressure and gauge pressure.
4. Can there be flow across a streamline ? Why ?
5. Define meta centre.
6. List out the assumptions made in deriving Bernoulli's theorem.
7. Define momentum thickness.
8. List any four minor losses that are encountered in pipe flow.
9. Write a note on distorted models.
10. List the similitude involved in the model analysis.

PART – B (5 × 16 = 80 marks)

11. (a) (i) Derive expression for the pressure inside a droplet and a free jet. **(6)**

(ii) A small thin plane surface is pulled through the liquid filled Space between two large horizontal planes in the parallel direction. Show that the force required will be minimum if the plate is located midway between the planes. **(10)**

OR

(b) (i) Derive the linear momentum equation using the Control volume approach. **(6)**

(ii) Derive an expression for the torque required to overcome the viscous resistance when a circular shaft of diameter 'D' rotating at 'N' rpm in a bearing with the clearance 't' varying uniformly from 't_1' m at one end to 't_2' m at the other end. The distance between the ends is 'L' m. The oil has a Viscosity of μ. **(10)**

12. (a) (i) Match the following : **(4)**

(1)	U-tube manometer	(A)	Moderately low pressures
(2)	Single tube manometers	(B)	Negative pressures
(3)	Inverted U— tube manometers	(C)	High pressures
(4)	U-tube differential manometer	(D)	Differences in pressure between two points

(ii) The water level in a canal is regulated by a flat tipper gate inclined at 60° to the bed. The tipping takes place about a fulcrum placed at a height of 1 m from the bed when the water level in the canal reaches a maximum value of H. Determine H. **(8)**

(iii) A piece of metal weighing 1.5 N in air is found to weigh 1.1 N when submerged in water. What is its volume and what is its specific gravity ? **(4)**

OR

(b) (i) Differentiate between the following :

(1) Steady flow and uniform flow

(2) Laminar flow and turbulent flow **(2 × 3 = 6)**

(ii) A three dimensional flow field is given by

$$V = 2x^2y\vec{i} + 3y^2z\vec{j} - (4xz + 3yz^2)\vec{k}.$$

Show that it is a case of possible steady, incompressible fluid flow. **(4)**

(iii) Explain a Pitot-Static tube with a sketch. How do you determine the flow velocity at any point using a Pitot-Static tube ? **(6)**

13. (a) (i) Explain the working of venturimeter for discharge measurement of a liquid flowing through a pipe. **(8)**

(ii) Water is flowing through a pipe having diameters 600 mm and 400 mm at the bottom and upper end respectively. The pressure intensity at bottom is 350 kN/m^2 and the same at top is 150 kN/m^2. Determine the difference in datum head if the discharge through the pipe is 50 litres per second. **(8)**

OR

(b) Derive Darcy-Weisbach equation and obtain Hagen-Poiseuille equation from Darcy's equation by substituting suitable value of co-efficient of friction in terms of Reynold's number. **(16)**

14. (a) (i) What are different major and minor losses when there is a flow through pipes ? **(8)**

(ii) Derive the expression for displacement thickness. **(8)**

OR

(b) Derive the equation for the friction loss in a pipe line also determine the friction in a pipe of 400 m long and 200 mm diameter when the discharge is 3 m^3/min and the resistance coefficient f = 0.01. **(16)**

15. (a) Write short notes on :

(i) Raleigh's method. **(6)**

(ii) Scale effect in model study. **(5)**

(iii) Buckingham's Pi-theorem. **(5)**

OR

(b) An oil of specific gravity 0.91 and viscosity of 0.03 poise is to be transported at the rate of 3 m^3/s through a 1.3 m diameter pipe. Model tests were conducted on a 130 mm diameter pipe using water having viscosity of 0.01 poise. Find the velocity of flow and discharge in the model. **(16)**

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