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320352(20)

B. E. (Third Semester) Examination, April-May 2021

(New Scheme)

(Civil Engg. Branch)

FLUID MECHANICS-I

Time Allowed : Three hours

Maximum Marks : 80

Minimum Pass Marks : 28

*Note : Attempt all questions. Part (a) is compulsory from each unit. Attempt any **two** parts from remaining (b), (c) and (d).*

Unit-I

1. (a) Define ideal plastic fluid.   2

    (b) Discuss the conditions of equilibrium of a floating body briefly.   7

(c) A rectangular plane surface 2 m and 3 m deep lies in water in such a way that its plane makes and angle of 30° with the free surface of water. Determine the total pressure and position of centre of pressure when the upper edge of 1·5 m below the free water surface. 7

(d) A solid cylinder of diameter 4·5 m has a height to 3·0 m find the meta-centric height of the cylinder when it is floating in water with its axis vertical. The specific gravity of the cylinder = 0·6. 7

Unit-II

2. (a) What is the laminar & turbulent flow? 2

(b) A stream function is given by $\phi = 2\,xy$. Show that the flow is irrotational and continuous. 7

(c) A fluid field is given by, $V = x^2yi + y^2zj - (2\,xyz + yz^2)\,K$. Prove that it is a case of possible steady incompressible fluid flow. Calculate the velocity and acceleration at the poitn (2, 1, 3). 7

(d) Define the flow : 7

(i) Stream tube

(ii) Streak line

(iii) Eulerian method

(iv) Non uniform flow

(v) Path line

Unit-III

3. (a) Derive Bernoulli's equation of motion for fluid flow by Euler's equation. 2

(b) A nozzle of dia. 20 mm is fitted to a pipe of dia. 40 mm. Find the force exerted by the nozzle on the water which is flowing through the pipe at the rate at 1·2 m³/minute. 7

(c) Give a tabular comparison between venturimeter and orifice meter. 7

(d) The top and bottom of a 2 m long vertical tapering pipe are 100 mm and 50 mm respectively. Water flows down the pipe at 30 lit/sec. find the pressure difference between the two ends of the pipe. 7

Unit-IV

4. (a) What do you mean by water laminar? 2

    (b) A rectangular channel has a width of 2·50 m and a bed slop of 1 in 400. What will be the depth of water if the rate of flow is 8·50 m³/sec. take $C = 50$. 7

    (c) Derive the condition for the rectangular channel of best section. Show that the hydraulic mean depth for such a channel is one-half the depth of flow. 7

    (d) Determine the maximum discharge of water through of circular channel of diameter 1·5 when the bed slop of the channel is 1 in 1000. Take $C_d = 0·60$. 7

Unit-V

5. (a) What is the purpose of fitting a mouthpiece to an orifice? 2

    (b) What is Cipoletti Weir? Explain. 7

    (c) Derive an expression for the discharge over a triangular weir. 7

(d) The water in a tank is 2 m deep and over the water surface, the air pressure is 70 kPa above atmospheric pressure. Find the rate of flow from an orifice of diameter 50 mm in the bottom of the tank. Take $C_d = 0·6$. 7