



# MARRI LAXMAN REDDY

## INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AN AUTONOMOUS INSTITUTION)

(Approved by AICTE, New Delhi &amp; Affiliated to JNTUH, Hyderabad)

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II B.Tech I Sem Regular End Examination, March 2021

**FLUID MECHANICS****(CIVIL)****Time: 3 Hours.****Max. Marks: 70**

Note: 1. Answer any FIVE questions.

2. Each question carries 14 marks and may have a, b as sub questions.

- 1 a) An oil film of thickness 1.8mm is used for lubrication between a square plate of size  $0.6\text{m}^2$  and an inclined plane having an angle of  $40^\circ$ . The weight of the square plate is 50kgf and it slides down the plane with a uniform velocity of 0.3m/s. Find the dynamic viscosity of the oil. 7M C04 BL3
- b) Differentiate between Newtonian and non - Newtonian fluids. Give three examples for each. 7M C02 BL1
- 2 Write Short notes on 14M C04 BL3  
 (i.) Vapour Pressure (ii.) Cavitation  
 (iii.) Surface Tension (iv.) Capillarity  
 Also list some practical applications of Surface Tension and Capillarity.
- 3 a) Starting with Euler's equation of motion along a streamline, obtain Bernoulli's equation by its integration. Draw the relevant line diagrams. Also list all the assumptions made. 7M C03 BL2
- b) List out the surface and body forces which influence the fluid motion. Also explain the significance of these forces. 7M C01 BL1
- 4 a) A pipe 13cm in diameter is used to transport oil of relative density 0.75 under a pressure of 2bar. If the total energy relative to a datum plane 3m below the centre of pipe is  $15\text{Nm/N}$ , work out the flow rate of oil. 7M C03 BL2
- b) The head of water over a rectangular notch is 900mm. The discharge is 300 litres/sec. Find the length of the notch, when  $C_d = 0.62$  7M C01 BL1
- 5 a) The stream function in a two dimensional flow field is  $\psi = 4x - 6y + 3xy$ . Verify whether the flow is irrotational. 7M C02 BL2  
 A bend in pipeline conveying water gradually reduces from 50cm to 20cm diameter and deflects the flow through an angle of  $60^\circ$ . At the
- b) larger end the gauge pressure is  $2.68\text{kg/cm}^2$ . Determine the magnitude and direction of the force exerted on the bend when the flow is 870litres/sec. 7M C04 BL3

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| 6 | a) | A horizontal pipeline 10cm in diameter is joined by sudden enlargement to 20cm diameter. Measurements indicate that when flow is from smaller to larger cross-section, the head loss is 0.4m in excess of that when the flow takes place from larger to smaller section. Determine the flow rate. Take coefficient of contraction $C_c = 0.63$ . | 7M | CO4 | BL3 |
|   | b) | Three pipes of lengths 800m, 500m, and 400m and of diameters 500mm, 400mm, and 300mm respectively are connected in series. These pipes are to be replaced by a single pipe of length 1700mm. Find the diameter of the single pipe.   | 7M | CO4 | BL3 |
| 7 | a) | A 6cm diameter pipe takes off abruptly from a large tank and runs 10m, then expands abruptly to 12cm diameter and runs 40m and next discharges directly into the open air with a velocity of 1.4m/s. Compute the necessary height of water surface above the point discharge. Take friction coefficient, $f=0.0065$ in the Darcy equation.       | 7M | CO3 | BL2 |
|   | b) | What do you mean by displacement, energy and momentum thicknesses? Write the relevant mathematical expressions.  | 7M | CO1 | BL1 |
| 8 | a) | Explain the phenomenon of separation of boundary layer by means of a neat sketch.  | 7M | CO2 | BL2 |
|   | b) | What do you mean by drag and lift forces? Mention any 4 applications of drag and lift forces.  | 7M | CO2 | BL2 |

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