

**Gandhi Institute of Engineering and Technology University, Odisha, Gunupur**  
**(GIET University)**



B. Tech (Fourth Semester – Regular/Supplementary) Examinations, April 2026

**23BCVPC24003 - Fluid Mechanics**

**(Civil Engineering)**

Time: 3 hrs

Maximum: 60 Marks

**Answer ALL questions**  
**(The figures in the right hand margin indicate marks)**

**PART – A**

**(2 x 5 = 10 Marks)**

Q.1. Answer **ALL** questions

|                                                                      | CO # | Blooms Level |
|----------------------------------------------------------------------|------|--------------|
| a. Explain atmospheric, gauge and vacuum pressures.                  | CO1  | K2           |
| b. What is the importance of vapour pressure?                        | CO2  | K2           |
| c. State the condition for Irrotational flow.                        | CO3  | K1           |
| d. Write the expressions for $C_v$ , $C_c$ and $C_d$ for an orifice. | CO4  | K1           |
| e. Define 'Hydraulic gradient line' and 'Total energy line'.         | CO5  | K1           |

**PART – B**

**(10 x 5 = 50 Marks)**

Answer **ALL** the questions

|                                                                                                                                                                                                                                                                                                                                                  | Marks | CO # | Blooms Level |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|------|--------------|
| 2. a. Define the following fluid properties: Density, weight density, specific volume and specific gravity of a fluid                                                                                                                                                                                                                            | 5     | CO1  | K1           |
| b. State and explain Newton's law of viscosity. Deduce the expression for the dynamic viscosity.                                                                                                                                                                                                                                                 | 5     | CO1  | K2           |
| <b>(OR)</b>                                                                                                                                                                                                                                                                                                                                      |       |      |              |
| c. Calculate the capillary rise in a glass tube of 4mm diameter when immersed in water at 20°C. Take the surface tension of water at 20°C as 0.0075 kg/m. What will be the percentage increase in the value of capillary rise if the diameter of the glass tube is 3 mm?                                                                         | 5     | CO1  | K3           |
| d. Explain the differences between a manometer and a mechanical gauge. What are the different types of mechanical pressure gauges                                                                                                                                                                                                                | 5     | CO1  | K2           |
| 3.a. A rectangular plate of 3m × 2m is submerged vertically in water such that its top edge is 2 m below the water surface. Calculate the total pressure and the centre of pressure.                                                                                                                                                             | 5     | CO2  | K3           |
| b. Explain the term total pressure acting on a plane surface immersed in a fluid at any angle. Obtain an expression and also for the depth of the centre of pressure                                                                                                                                                                             | 5     | CO2  | K2           |
| <b>(OR)</b>                                                                                                                                                                                                                                                                                                                                      |       |      |              |
| c. What is metacentric height? Explain how it is calculated.                                                                                                                                                                                                                                                                                     | 5     | CO2  | K2           |
| d. Compare the stability of submerged and floating bodies                                                                                                                                                                                                                                                                                        | 5     | CO2  | K1           |
| 4.a. Define stream function and velocity potential. What are their uses?                                                                                                                                                                                                                                                                         | 5     | CO3  | K3           |
| b. The water is flowing through a pipe having diameters of 20 cm & 15 cm at sections 1 and 2, respectively. The rate of flow through the pipe is 40 litres/s. Section 1 is 6 m above the datum line, and section 2 is 3 m above the datum. If the pressure at section 1 is 29.43 N/cm <sup>2</sup> , find the intensity of pressure at section 2 | 5     | CO3  | K1           |
| <b>(OR)</b>                                                                                                                                                                                                                                                                                                                                      |       |      |              |

|      |                                                                                                                                                                                                                                                                                                            |   |     |    |
|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|-----|----|
| c.   | What are the applications of the Venturimeter? Explain the working principle of a venturimeter                                                                                                                                                                                                             | 5 | CO3 | K1 |
| d.   | A Venturimeter of throat diameter 5cm is fitted into a 12.5 cm diameter water pipeline. The coefficient of discharge is 0.96. Calculate the flow in the pipeline when the reading on a mercury water differential U-tube manometer connected to the upstream and throat sections shows a reading of 20 cm. | 5 | CO3 | K1 |
| 5.a. | What are the different losses in flow through the circular pipes? Explain it.                                                                                                                                                                                                                              | 5 | CO4 | K1 |
| b.   | Two pipes of equal length (100 m) are connected in parallel between two tanks with a head difference of 2 m. Pipe A has a diameter of 0.1 m, Pipe B has a diameter of 0.05 m. Friction factor = 0.02. Find the total discharge                                                                             | 5 | CO4 | K1 |
| (OR) |                                                                                                                                                                                                                                                                                                            |   |     |    |
| c.   | A pipe of diameter 400 mm carries water at a velocity of 25 m/s. The pressures at the points A and B are given as 29.43 N/cm <sup>2</sup> and 22.563 N/cm <sup>2</sup> , respectively, while the datum heads at A and B are 28 m and 30 m. Find the loss of head between A and B                           | 5 | CO4 | K1 |
| d.   | Explain how the following flow problems are analyzed. i) Series pipe connection (ii) parallel pipe connection iii) Equivalent pipe connection                                                                                                                                                              | 5 | CO4 | K2 |
| 6.a. | Define open channel flow. Classify different types of open channels and explain their characteristics.                                                                                                                                                                                                     | 5 | CO5 | K2 |
| b.   | An open channel is V – shaped with each side being inclined at 45° to the vertical. If it carries a discharge of 0.04 m <sup>3</sup> /s, when the depth of flow at the centre is 225 mm, calculate the slope of the channel assuming that Chezy's C = 50.                                                  | 5 | CO6 | K3 |
| (OR) |                                                                                                                                                                                                                                                                                                            |   |     |    |
| c.   | Discuss the characteristics of critical, subcritical, and supercritical flows                                                                                                                                                                                                                              | 5 | CO5 | K2 |
| d.   | A rectangular channel is 3 m wide and has a uniform bed slope of 1 in 600. If the depth of flow is constant at 2 m calculate (a) the hydraulic mean depth, (b) the velocity of flow, (c) the volume rate of flow. Assume that the value of the coefficient C in Chezy's formula is 55.                     | 5 | CO6 | K3 |

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