# K. K. Wagh Institute of Engineering Education & Research, Nashik

(An Autonomous Institute From A.Y. 2022-23)

| WINTER-2025 | |
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| Exam Seat No.: | |
| Academic Year: 2025-2026 | Semester: IV |
| Class: SY | Program: B.Tech |
| Branch Code: CHE | Pattern: 2023 |
| Name of Course: Fluid Mechanics | Course Code: 2307216 |
| Max. Marks: 60 | Duration: 2.30 Hrs. |

**Instructions:** Candidates should read carefully the instructions printed on the Question Paper and on the cover page of the Answer Book, which is provided for their use.

1. This question paper contains two pages.
2. Answer to each new question is to be started on a new page.
3. Assume suitable data wherever required, but justify it.
4. Draw the neat labelled diagrams, wherever necessary.
5. The last columns indicates the Course Outcome.

| | | Marks | CO |
|---|---|---|---|
| **Question No. 1** | | | |
| 1a) | Explain different types of non-Newtonian fluids with graphical representation and their examples. | (6) | CO1 |
| **Question No. 2** | | | |
| 2a) | A simple U-tube manometer containing mercury is connected to a pipe in which a fluid of sp. gr. 0.8 and having vacuum pressure is flowing. The other end of the manometer is open to atmosphere. Find the vacuum pressure in pipe, if the difference of mercury level in the two limbs is 40 cm and the height of fluid in the left from the centre of pipe is 15 cm below. | (6) | CO2 |
| **Question No. 3** | | | |
| 3a) | Derive expression of discharge for venturimeter. | (8) | CO3 |
| | **OR** | | |
| 3b) | Explain principle, construction and working of orifice meter with neat diagram. | (8) | CO3 |
| 3c) | A 25 cm diameter pipe carries oil of specific gravity 0.9 at 3 m/s. At another section, the diameter is 20 cm. Find the mass flow rate (Kg/s) of oil. | (8) | CO3 |
| | **OR** | | |
| 3d) | An orifice meter with inlet and orifice plate diameters as 20 and 10 cm respectively is used to measure flow rate of oil of specific gravity 0.9. Discharge of oil through orifice meter is 100 lit/s, find reading of oil-mercury differential manometer. Take $C_d = 0.62$. | (8) | CO3 |
| **Question No. 4** | | | |
| 4a) | Explain and derive expressions of different dimensionless numbers in fluid mechanics. | (8) | CO4 |
| | **OR** | | |
| 4b) | What do you mean by major and minor losses through the pipeline? Explain with equations. | (8) | CO4 |
| 4c) | Show that for laminar flow of fluid through pipeline, $f = 16/Re$. | (8) | CO4 |
| | **OR** | | |

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| 4d) | An oil of kinematic viscosity 0.5 stoke is flowing through a pipe of diameter 300 mm at the rate of 320 litres per second. Find the loss of head due to friction for a length of 60 m of the pipeline. | (8) | CO4 |

**Question No. 5**

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| 5a) | Explain the different types of heads in a centrifugal pump and define overall efficiency. How are these parameters related to the performance of the pump. | (8) | CO5 |

**OR**

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| 5b) | Discuss the velocity distribution across the boundary layer and explain the significance of the inflection point for stability of the flow. | (8) | CO5 |
| 5c) | What is the expression for drag force on one side of a flat plate due to laminar boundary layer development. | (8) | CO5 |

**OR**

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| 5d) | A centrifugal pump delivers water against a net head of 14.5 metres and a design speed of 1000 r.p.m. The vanes are curved back to an angle of 30° with the periphery. The impeller diameter is 300 mm and outlet width is 50 mm. Determine the discharge of the pump if manometric efficiency is 95%. | (8) | CO5 |

**····· End of question paper·····**