|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Roll No. |  |  |  |  |  |  |  |  |  |  |  |  |

**PRESIDENCY UNIVERSITY**

**Bengaluru**

|  |
| --- |
| **End - Term Examinations – JANUARY 2025** |
| **Date:** 15 – 01- 2025 **Time:** 01:00 pm – 04:00 pm |

|  |  |  |
| --- | --- | --- |
| **School:** SOE | **Program:** B. Tech-CIV | |
| **Course Code :**CIV2009 | **Course Name :** Fluid Mechanics | |
| **Semester**: III | **Max Marks**: 100 | **Weightage**: 50% |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **CO - Levels** | **CO1** | **CO2** | **CO3** | **CO4** | **CO5** |
| **Marks** | **10** | **38** | **52** | **-** | **-** |

**Instructions:**

1. *Read all questions carefully and answer accordingly.*
2. *Do not write anything on the question paper other than roll number.*

**Part A**

**Answer ALL the Questions. Each question carries 2marks. 10Q x 2M=20M**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **1** | Define the following  a) Surface tension b) Viscosity | **2 Marks** | **L1** | **CO1** |
| **2** | Show Bernoulli’s equation for Real and ideal fluids | **2 Marks** | **L1** | **CO2** |
| **3** | List the major and minor losses through pipe system | **2 Marks** | **L1** | **CO3** |
| **4** | Show the relation between and velocity of fluid and shear stress as per Newton’s law of Viscosity | **2 Marks** | **L1** | **CO1** |
| **5** | Define Reynold’s number and what is range of Reynold’s number for transitional flow | **2 Marks** | **L1** | **CO2** |
| **6** | List any two applications of fluid mechanics in the field of civil engineering | **2 Marks** | **L1** | **CO1** |
| **7** | Show the relation between atmospheric pressure, gauge pressure and absolute pressure | **2 Marks** | **L1** | **CO1** |
| **8** | Define the following  a) Compressible flow b) Incompressible flow | **2 Marks** | **L1** | **CO2** |
| **9** | Define the following  a) Newtonian fluid b) Non Newtonian fluid | **2 Marks** | **L1** | **CO1** |
| **10** | Show Darcy-Weisbach equation which used to calculate major losses in pipe flow system | **2 Marks** | **L1** | **CO3** |

**Part B**

**Answer the Questions. Total Marks 80**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **11** | **11a** | Oil of specific gravity 0.90 flows in a pipe 300 mm diameter at the rate of 120 lites/second and the pressure at a point A is 24.525 kpa. If point A is 5.2 m above the datum line, calculate the total energy at point A in terms of meters of oil. | **8Marks** | **L3** | **CO2** |
| **11b** | A horizontal Venturimeter with inlet and throat diameters 20 cm and 10 cm respectively is used to measure flow of water. The reading of differential monometer connected to the inlet and the throat is 20 cm of mercury. Determine the rate of flow take Cd =0.98. | **12Marks** | **L3** | **CO2** |
| **or** | | | | | |
| **12** | **12a** | The water is flowing through a pipe having diameter 20 cm and 10 cm at sections 1 and 2 respectively. The rate of flow through pipe is 35 litres/sec. the section 1 is 6 m above datum and section 2 is 4 m above datum. If the pressure at section 1 is 39.24 N/cm2 . Find the intensity of pressure at section 2. | **8Marks** | **L3** | **CO2** |
| **12b** | An orifice meter with orifice diameter 10 cm is inserted in a pipe of 20 cm diameter. The pressure gauges fitted upstream and downstream of the orifice meter gives readings of 19.62 N/cm2 and 9.81 N/cm2 respectively. Co-efficient of discharge for the orifice meter is given as 0.64. Find the discharge of water through pipe. | **12Marks** | **L3** | **CO2** |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
| **13** | **13a** | With neat diagram explain the working principle of Venturimeter | **8Marks** | **L2** | **CO2** |
| **13b** | Find the head loss due to friction in a pipe of diameter 300 mm and length 50 m, through which water is flow at a velocity of 3 m/s using a) Darcy formula, b) Chezy’s formula for which C = 60. Take kinematic viscosity of water = 0.01 stoke. | **12Marks** | **L3** | **CO3** |
| **Or** | | | | | |
| **14** | **14a** | With neat diagram explain the working principle of orifice meter | **8Marks** | **L2** | **CO2** |
| **14b** | A crude oil of kinematic viscosity 0.4 stoke is flowing through a pipe of diameter 300 mm at the rate of 300 liters/sec. Find the head loss due to friction for a length of pipe 50 m. | **12 Marks** | **L3** | **CO3** |
|  |  |  |  |  |  |
| **15** | **15a** | A main pipe divides in to two parallel pipes which again forms one pipe .The length and diameter for the first parallel pipe are 4000 m and 1 m respectively, while the length and diameter of 2nd parallel pipe are 4000 m and 0.8 m. Find the rate of flow in each parallel pipe, if total flow in the main is 3.0 m3/s . The co-efficient of friction for each parallel pipe is same and equal to 0.0048. | **8Marks** | **L3** | **CO3** |
| **15b** | At a sudden enlargement of water main from 240 mm to 480 mm diameter, the hydraulic gradient rises by 10 mm. Estimate rate of flow. | **12Marks** | **L3** | **CO3** |
| **or** | | | | | |
| **16** | **16a** | Three pipes of length 800 m, 500 m and 400 m and of diameters 500 mm, 400 mm and 300 mm respectively are connected in series. These pipes are to be replaced by a single pipe of length 1700 m. Find the diameter of single pipe. | **8Marks** | **L3** | **CO3** |
| **16b** | A main pipe divides in to two parallel pipes which again forms one pipe. The length and diameter for the first parallel pipe are 3000 m and 0.8 m respectively, while the length and diameter of 2nd parallel pipe are 3000 m and 0.6 m. Find the rate of flow in each parallel pipe, if total flow in the main is 3.8 m3/s . The co-efficient of friction for pipe 1 = 0.0052, and for pipe 2 = 0.0048 | **12Marks** | **L3** | **CO3** |
|  |  |  |  |  |  |
| **17** | **17a** | Compare flow internal flow and external flow | **4Marks** | **L2** | **CO2** |
| **17b** | The difference in water surface levels in two tanks, which are connected by three pipes in series of lengths 300 m, 170 m and 210 m and of diameters 300 mm, 200 mm and 400 mm respectively, is 12 m. Determine the rate of flow of water If co-efficient of friction for these pipes is same and equal to 0.005, considering: a) Minor losses also b) Neglecting minor losses. | **16 Marks** | **L3** | **CO3** |
| **Or** | | | | | |
| **18** | **18a** | Compare uniform flow and non-uniform flow | **4Marks** | **L2** | **CO2** |
| **18b** | Three pipes of 400 mm, 200 mm and 300 mm diameters have lengths of 400 m, 200 m and 300 m respectively. They are connected in series to make a compound pipe. The ends of this compound pipe are connected with two tanks whose difference in levels is 16 m. If co-efficient of friction for these pipes is same and equal to 0.005, determine the discharge through the compound pipe neglecting first the minor losses and then including them. | **16Marks** | **L3** | **CO3** |

**\*\*\*\*\* BEST WISHES \*\*\*\*\***