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**UNIVERSITY**

(Karunya Institute of Technology & Sciences)

(Declared as Deemed-to-be University under Sec.3 of the UGC Act, 1956)

Reg.No. \_\_\_\_\_\_\_\_\_\_\_\_\_

**End Semester Examination – Nov/Dec - 2016**

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|  |  | **Semester :** | **2016-17 ODD** |
| **Code :** | **09CE202/12CE205/CE277** | **Duration :** | **3 hrs** |
| **Sub. Name :** | **Mechanics of Fluids** | **Max. marks :** | **100** |

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| **Q. No.** | **Questions** | **Marks** |
| **PART-A(10X1=10 MARKS)** | | |
| 1. | Compare dynamic viscosity and kinematic viscosity. | (1) |
| 2. | Calculate the specific gravity of one litre of crude oil weighing 11 N. | (1) |
| 3. | What is buoyancy? | (1) |
| 4. | Distinguish between laminar and turbulent flow. | (1) |
| 5. | Define “stream function” | (1) |
| 6. | What is hydraulic gradient line? | (1) |
| 7. | Mention where Cipolletti weir is used in practice. | (1) |
| 8. | Highlight the assumptions made in the derivation of Bernoulli’s equation. | (1) |
| 9. | Define the term ‘dimensionally homogeneous’ | (1) |
| 10. | State Reynolds Theorem. | (1) |

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| **PART B(5 X 3= 15 MARKS)** | | |
| 11 | The velocity distribution for flow over a flat plate is given by , where u is the point velocity in m/sec at a distance ‘y’ metre above the plate. Determine the shear stress at y = 9 cm. Assume dynamic viscosity as 8 poise. | (3) |
| 12 | What do you mean by equipotential line and a line of constant stream function? | (3) |
| 13 | Give the formula to find friction loss highlighting the friction coefficient. | (3) |
| 14 | A jet of water, issuing from a sharp-edged vertical orifice under a constant head of 100 mm, at a certain point, has the horizontal and vertical co-ordinates measured from the vena-contracta as 200mm and 105mm respectively. Find the value of Cv. Also find the value of Cc if Cd = 0.62. | (3) |
| 15 | Present the different types of similarities. | (3) |

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| **PART C(5 X 15= 75 MARKS)** | | | |
| 16 |  | An oil film of thickness 1.2mm is used for lubrication between a square plate of size 0.9m x 0.9m and an inclined plane having an angle of inclination 20˚. The weight of the square plate is 400N and it slides down the plane with a uniform velocity of 0.25m/sec. Find the dynamic viscosity of the oil. | (15) |
| (OR) | | | |
| 17. |  | A cylindrical gate of 4m diameter 2m long has water on its both sides as shown in Fig. l. Determine the magnitude, location and direction of the resultant force exerted by the water on the gate. Find also the least weight of the cylinder so that it may not be lifted away from the floor.  **A**  Water surface    Fy1    Fy2  **D**  Water surface  4m  **B**  Fx2  Fx1  **D**  Fig.1 | (15) |
| 18. |  | State Bernoulli’s equation for the flow of an incompressible fluid. Derive an expression for Bernoulli’s theorem from first principle and state the assumptions made for such a derivation. | (15) |
| (OR) | | | |
| 19. |  | In a two dimensional incompressible flow, the fluid velocity components are given by u = x – 4y and v = - y - 4x. Show that the velocity potential exists and determine its form as well as stream function | (15) |
| 20. |  | Derive an expression for Hagen Poiseuille’s formula | (15) |
| (OR) | | | |
| 21. |  | A horizontal pipe of diameter 500mm is suddenly contracted to a diameter of 250mm. The pressure intensities in the large and smaller pipe is given as 13.734N/cm2 and 11.772 N/cm2 respectively. Find the loss of head due to contraction if Cc = 0.62. Also determine the rate of flow of water. | (15) |
| 22. |  | Derive an expression for the discharge through a Venturimeter. | (15) |
| (OR) | | | |
| 23. |  | A 20cm x 10cm Venturimeter is provided in a vertical pipe line carrying an oil of specific gravity 0.8, the flow being upwards. The difference in elevation of the throat section and entrance section of the Venturimeter is 50 cm. The differential U tube mercury manometer shows a gauge deflection of 40cm. Calculate: i) the discharge of oil and ii) the pressure difference between throat section and entrance section. Take Cd = 0.98 and specific gravity of mercury as 13.6. | (15) |
| 24. | a. | Derive an expression to determine the discharge through a rectangular notch. | (10) |
|  | b. | Find the discharge over a rectangular weir of length 80m. The head of water over the weir is 1.2m. The velocity of approach is given as 1.5m/sec. Take Cd = 0.6 | (5) |
| (OR) | | | |
| 25. |  | The resisting force R of a supersonic plane during flight can be considered as dependent upon the length of the aircraft L, velocity V, air viscosity μ, air density ρ and bulk modulus of air K. Express the functional relationship between these variables and the resisting force. | (15) |

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