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**SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR**  
(AUTONOMOUS)

**B.Tech II Year I Semester Supplementary Examinations June 2019**

**FLUID MECHANICS**

(Civil Engineering)

Time: 3 hours

Max. Marks: 60

(Answer all Five Units 5 x 12 = 60 Marks)

**UNIT-I**

- 1 a Explain the following fluid properties: specific weight, mass density, specific volume and specific gravity. Give their units. 7M
- b A flat plate of area  $1.5 \times 10^6 \text{ mm}^2$  is pulled with a speed of 0.4 m/s relative to another plate located at a distance of 0.15 mm from it. Find the force and power required to maintain this speed, if the fluid separating them is having a viscosity of 1poise. 5M

**OR**

- 2 a A rectangular plane surface 3 m wide and 4 m deep lies in water in such a way that its plane makes an angle of  $30^\circ$  with the free surface of water. Determine the total pressure force and position of centre of pressure, when the upper edge is 2 m below the free surface. 7M
- b State and prove the Pascal's law. 5M

**UNIT-II**

- 3 a Derive the continuity equation for three dimensional flow. 7M
- b If for a two dimensional potential flow, the velocity potential is given by  $\Phi = x(2y-1)$  determine the stream function  $\Psi$ . 5M

**OR**

- 4 a A 300 mm diameter pipe carries water under a head of 20 m with a velocity of 3.5 m/s. If the axis of the pipe turns through  $45^\circ$ , find the magnitude and direction of the resultant force on the bend. 7M
- b State and explain the Impulse momentum equation. 5M

**UNIT-III**

- 5 a Explain the terms: (i) Pipes in parallel and (ii) Pipes in series. 7M
- b What are minor losses in pipe flow? List the various minor losses and give expressions for the same. 5M

**OR**

- 6 a Derive the equation for the loss of head due to friction in pipes for turbulent flow. 7M
- b Explain the difference between hydrodynamically smooth and rough boundaries. 5M

**UNIT-IV**

- 7 a A horizontal venturimeter with inlet diameter 20 cm and throat diameter 10 cm is used to measure the flow of water. The pressure at inlet is  $17.658 \text{ N/cm}^2$  and the vacuum pressure at the throat is 30 cm of mercury. Find the discharge of water through the venture meter. Take  $C_d = 0.98$ . 7M
- b What is a pitot tube? How is it used to determine the velocity at any point? 5M

**OR**

- 8 a Water flows through a triangular right-angled weir first and then over a rectangular weir of 1 m width. The discharge co-efficients of the triangular and rectangular weirs are 0.6 and 0.7 respectively. If the depth of water over the triangular weir is 360 mm, find the depth of water over the rectangular weir. 7M
- b Define an orifice and a mouthpiece. How orifices are classified based on size, shape and sharpness? 5M

**UNIT-V**

- 9 a A fluid of viscosity  $0.7 \text{ Ns/m}^2$  and specific gravity 1.3 is flowing through a circular pipe diameter 100 mm. The maximum shear stress at the pipe wall is given as  $196.2 \text{ N/m}^2$ . Find (i) the pressure gradient, (ii) the average velocity and (iii) Reynolds number of the flow. 7M
- b Describe the Reynolds experiment to demonstrate the regimes of flow. 5M

**OR**

- 10 a What is boundary layer? Explain the growth of boundary layer along a thin flat plate. 7M
- b Explain the terms: Drag and lift. 5M

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