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

B.Tech II Year II Semester Regular &amp; Supplementary Examinations May 2019

FLUID MECHANICS &amp; HYDRAULIC MACHINERY

(Electrical &amp; Electronics Engineering)

Time: 3 hours

Max. Marks: 60

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

**UNIT-I**

- 1 a State the Newton's law of viscosity. Differentiate between kinematic viscosity and dynamic viscosity. Give their dimensions. 5M
- b A 15 cm diameter vertical cylinder rotates concentrically inside another cylinder of diameter 15.10 cm. Both cylinders are 25 cm high. The space between the cylinders is filled with a liquid whose viscosity is unknown. If a torque of 12.0 N m is required to rotate the inner cylinder at 100 r.p.m, determine the viscosity of the fluid. 7M

**OR**

- 2 a State and prove the Pascal's law. 6M
- b Calculate the pressure at a depth of 0.3 m below the surface of the following fluids:  
i) Water                      ii) An oil of specific gravity 0.8 and  
iii) Mercury of specific gravity 13.6. Take density of water as 1000 kg/m<sup>3</sup>. 6M

**UNIT-II**

- 3 a Define the following terms: Velocity potential function, stream function, equipotential line and flow net. 4M
- b If for a two dimensional potential flow, the velocity potential is given by  $\Phi = x(2y - 1)$ , determine the velocity at the point P (4, 5). Also determine the value of stream function  $\Psi$  at the point P. 8M

**OR**

- 4 a State the Impulse- Momentum equation. 2M
- b 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°, find the magnitude and direction of the resultant force at the bend. 10M

**UNIT-III**

- 5 a The difference in water surface levels in two tanks, which are connected by three pipes in series of lengths 300 m, 170 m, 210 m and of diameters 300 mm, 200 mm, 400 mm respectively, is 12 m. Determine the rate of flow of water, if the values of co-efficient of friction are 0.005, 0.0052 and 0.0048 respectively,  
(i) considering minor losses and (ii) neglecting minor losses. 10M
- b What is an 'Equivalent pipe'? 2M

**OR**

- 6 a Derive an expression for the discharge through an orifice meter. 6M
- b A horizontal venture meter with inlet and throat diameters of 30 cm and 15 cm respectively is used to measure the flow of water. The reading of differential manometer connected to the inlet and the throat is 20cm of mercury. Determine the rate of flow. Take  $C_d = 0.98$ . 6M

**UNIT-IV**

- 7 a What is 'dimensional homogeneity'? Explain. 4M
- b State and explain the Buckingham's pi- theorem. 8M

**OR**

- 8 a Explain the geometric, kinematic and dynamic similarities. 8M
- b State and derive Reynolds' model law. 4M

**UNIT-V**

- 9 a** Explain the classification of hydraulic turbines. 6M
- b** A Pelton wheel has a mean bucket speed of 10 m/s with a jet of water flowing at the rate of 700 litres/s under a head of 30m. The buckets deflect the jet through an angle of  $160^\circ$ . Calculate the power given by water to the runner and the hydraulic efficiency of the turbine. Assume Co-efficient of velocity as 0.98. 6M

**OR**

- 10 a** Explain the working principle of a single stage centrifugal pump. 6M
- b** Derive the expression for the specific speed of a centrifugal pump. 6M

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