Q.P. Code: 16CE112 **R16**

Reg. No: | | | | | | | | | | |

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR
(AUTONOMOUS)
B.Tech II Year I Semester (R16) Regular Examinations Nov/Dec 2017
FLUID MECHANICS ANDHYDRAULIC MACHINES
(Common to ME)

Time: **3 hours** Max. Marks: **60**

(Answer all Five Units **5 X 12 = 60** Marks)

UNIT-I

1	a	Explain the phenomenon of viscosity. Derive the relation for viscosity. State its uses and applications.	6M
	b	A cylinder of 150 mm radius rotates concentrically inside a fixed cylinder of 155 mm radius. Both cylinders are 300 mm long. Determine the viscosity of the liquid which fills the space between the cylinders if a torque of 0.98 N.m. is required to maintain a speed of 60 rpm.	6M

OR

2	a	Explain the working principle of Bourdon's pressure gauge with a neat sketch.	6M
	b	A differential manometer connected at the two points A and B at the same level in a pipe containing an oil of specific gravity 0.8, shows a difference in mercury level as 100 mm. Determine the difference in pressure at the two points.	6M

UNIT-II

3	a	Explain the terms: Stream line, Streak line, Streak tube, Control volume and flow net.	5M
	b	If for a two dimensional potential flow, the velocity potential is given by $\varphi = x(2y - 1)$. Determine the velocity at the point P(4,5). Also determine the value of stream function at P.	7M

OR

4	a	What is the difference between momentum equation and impulse momentum equation?	5M
	b	A vertical wall is of 8 m in height. A jet of water is coming out from a nozzle with a velocity of 20 m/s. The nozzle is situated at a distance of 20 m from the vertical wall. Find the angle of projection of the nozzle to the horizontal so that the jet of water just clears the top of the wall.	7M

UNIT-III

5	a	Derive the Darcy-Weisbach equation for computing head loss due to friction, in pipe lines.	7M
	b	Explain the terms: Pipes in parallel, Pipes in series, Equivalent pipe.	5M

OR

6 a What is the difference between pitot- tube and pitot-static tube? 5M

b An orifice meter with orifice diameter 150 mm is inserted in a pipe of 300 mm diameter. Oil of specific gravity 0.8 is flowing through the orifice meter in which the pressure difference is measured by a mercury oil differential manometer on the two sides of the orifice meter. Find the rate of flow of soil when the reading of manometer is 400 mm. 7M

UNIT-IV

7 a State Buckingham's π - theorem. Why this theorem is considered superior over the Rayleigh's method for dimensional analysis? 5M

b The pressure drop in an aeroplane model of size 1/50 of its prototype is 4 N/cm^2. The model is tested in water. Find the corresponding pressure drop in the prototype. Take density of air = 1.24 kg/m^3. The viscosity of water is 1.01 poise while the viscosity of air is 0.00018 poise. 7M

OR

8 a What is meant by geometric, kinematic and dynamic similarities? 5M

b A 1 : 20 model of a flying boat is towed through water. The prototype is moving in sea-water of density 1024 kg/m^3 at a velocity of 15 m/s. Find the corresponding speed of the model. Also determine the resistance due to waves on model, if the resistance due to waves of prototype is 500 N. 7M

UNIT-V

9 a How the hydraulic turbines are classified? Explain the different types of efficiency of a turbine. 5M

b Derive an expression for the work done per sec by liquid on the runner of a Francis turbine. 7M

OR

10 a What is the difference between single stage and multistage pumps? Describe the multistage pump with impeller in series and impeller in parallel. 6M

b The internal and external diameters of the impeller of a centrifugal pump are 300 mm and 600 mm respectively. The pump is running at 1000 rpm. The vane angles at inlet and outlet are 20^o and 30^o respectively. The water enters the impeller radially and velocity of flow is constant. Determine the work done by the impeller per unit weight of water. 6M

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