CE-509 **Roll No.** | | | | | | | | | | |

B. Tech.
(SEM V) ODD SEMESTER EXAMINATION 2015-16
Fluid Mechanics

Time: 2 Hours ***Total Marks: 50***

Note: **(i)** Attempt ALL questions.
(ii) Marks are indicated against each question.
(iii) Assume any data suitably, if required and not given.

1.	Attempt any **FOUR** parts of the following		**5x4=20**
	(a)	What is the difference between fluids and the solids? List out various properties of the fluids and define any three of these including the Dynamic viscosity.	
	(b)	Differentiate in between i. Newtonian and Non-Newtonian fluid ii. Ideal and Real Fluid iii. Steady and Unsteady Fluid iv. Rotation and Circulation v. Stream lines and Path lines	
	(c)	Derive the continuity equation for three dimensional flows.	
	(d)	Define and Explain Velocity Potential and Stream Function giving their expressions. Write the relation in between Stream Function and Velocity Potential. Verify whether the following function satisfies the continuity equation or not. $\Phi = A(x^2 - y^2)$	
	(e)	Show that the flow is possible for the following velocity components. $u = 2xy$; $v = a^2 + x^2 - y^2$ Also derive the relation for the stream function in this case.	
2.	Attempt any **TWO** parts of the following		**5x2=10**
	(a)	Derive an expression of Total Pressure and Centre of Pressure for a plate lying vertically in a fluid. In your opinion what happens to the relative distance between the center of pressure and center of gravity, if the plate is taken down to deeper depths. An annular plate 2 m external diameter and 1 m internal diameter with its greatest and least depths below the surface being 1.5 m and 0.75 m respectively. Calculate the magnitude, direction and location of the force acting upon one side of the plate due to water pressure	
	(b)	Derive the Bernoulli's equation. A pile line carrying oil of Sp. Gr. 0.80 changes in diameter from 300mm at section-1 to 600mm at section-2, such that vertical distance between these sections is 5.00m. If pressure at section-1 and section-2 are 100 kN/m^2 and 60 kN/m^2 respectively under a discharge of 300 lit/sec, determine the loss of head and direction of flow.	

	(c)	Derive the equation for the orifice meter. Why the coefficient of discharge is much lower in case of Orifice meter that that of the Venturi meter.	
3.	Attempt any **TWO** parts of the following		**5x2=10**
	(a)	Differentiate between the Laminar and Turbulent flows. Derive the Hazen-Poiseuille equation for velocity. Also state the assumptions involved in it.	
	(b)	What are various methods of measurement of viscosity? Explain any one of these. Define the terminal velocity. In a falling sphere viscometer, a lubricating oil of density 900 kg/m^3 was placed in a 80 mm inside diameter tube. A 10 mm diameter steel ball of density 8000 kg/m^3 was found to travel a distance of 950 mm in 19 seconds. Determine the viscosity of the oil.	
	(c)	What do you understand by the term 'Eddy Viscosity' ? How Dynamic viscosity is different that of Eddy viscosity. Give a neat sketch of LDA for the velocity measurement.	
4.	Attempt any **TWO** parts of the following		**5x2=10**
	(a)	What is the principle of dimensional homogeneity?	
	(b)	Define Geometrical Similarity and Kinematic Similarity?	
	(c)	State and explain the Buckingham's π-theorem. What are dimensional numbers Define any three of the dimensional numbers	