GUJARAT TECHNOLOGICAL UNIVERSITY PDDC- SEMESTER III- • EXAMINATION -WINTER- 2016

Subject Code: X31901Date:30/12Subject Name: Fluid MechanicsTime:10:30 AM to 1:00 PMTotal MarkInstructions:Total Mark			2/2016 ks: 70	
Q.1	(a)	Define the following terms. (1) Mass density (2) Weight density (3) Specific volume (4) Specific gravity (5) Surface tension (6) Dynamic viscosity (7) Kinematic viscosity	07	
	(b)	Two plates are placed at distance of 0.3 mm apart. Lower plate is fixed while upper plate having surface area one m^2 is pulled at 0.3 m/s. Find force and power required to maintain this speed. If the fluid separating them is having viscosity of 3.0 poise.	07	
Q.2	(a)	Define the following terms related to pressure measurement : Absolute pressure , Gauge pressure and Vacuum pressure. Calculate the pressure due to column of (1) mercury of specific gravity 13.6 (2) 50 cm of water	07	
	(b)	What do you understand by single column manometer ? Deduce an expression for the pressure measurement.	07	
	(b)	State and explain Pascal's law.	07	
Q.3	(a)	Deduce an expression for the meta centric height of a floating body experimentally with usual notation	07	
	(b)	A wooden block of size 2.0 meter x 1 meter x 0.8 meter floats in water. Determine meta centric height of the block. Specific gravity = 0.70 for wooden block.	07	
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Q.3	(a)	Define total hydrostatic force and centre of pressure. Derive an expression for the force exerted on a sub-merged vertical plane surface by the static liquid and locate the position of centre of pressure.	07	
	(b)	Determine the total pressure on a circular plate of diameter 2.0 meter which is placed vertically in water such that the center of plate is 5.0 meter	07	

below the free surface of water. Find the position of centre of pressure .

07

- Q.4 (a) Differentiate between the following :
 - (1) Laminar flow and Turbulent flow
 - (2) Compressible flow and Incompressible flow
 - (3) Uniform flow and Non uniform flow
 - (b) A crude oil of viscosity 0.95 poise and relative density 0.9 is flowing 07 through a horizontal circular pipe of diameter 100 mm and a length of 5 meter long. Calculate the difference of pressure at the two ends of the pipe, if flow rate is $0.004 \text{ m}^3/\text{s}$

OR

- Q.4 (a) Explain the working of Venturimeter with neat sketch. 07 A horizontal Venturimeter 50 cm x 25 cm is used to measure the water flow through a pipe. The head causing the flow is measured as 13 cm of Hg by mercury U tube manometer. Find the flow rate in liters/min. Take $C_d=0.92$
 - (b) Derive an expression for the discharge of water over the V notch with 07 usual notation.
- **Q.5** (a) State Buckingham's π theorem. What do you mean by repeating variables ? 07 How are the repeating variables selected in dimensional analysis
 - (b) Derive an expression for velocity of sound wave for a compressible fluid 07 when the process is assumed as :
 - (1) Isothermal
 - (2) Adiabatic

OR

- Q.5 (a) Derive an expression for the velocity distribution for viscous flow through 07 a circular pipe. Also sketch the velocity distribution and shear stress distribution across a section of the pipe.
 - (b) A crude oil of viscosity 0.90 poise and relative density 0.88 is flowing 07 through a horizontal circular pipe of diameter 100 mm and a length of 5 meter long. Calculate the difference of pressure at the two ends of the pipe, if flow rate is $0.005 \text{ m}^3/\text{s}$
