

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER-IV (NEW) EXAMINATION – WINTER 2018

Subject Code:2141906

Date:01/12/2018

Subject Name:Fluid Mechanics

Time: 02:30 PM TO 05:00 PM

Total Marks: 70

Instructions:

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

		MARKS
Q.1	(a) Define: Specific gravity, Density, Cavitation	03
	(b) Explain surface tension and derive its equation for liquid droplet.	04
	(c) State and derive Pascal's law with usual notations. States its applications.	07
Q.2	(a) What are the advantages and disadvantages of manometers as pressure measuring instrument?	03
	(b) A body of dimensions 2m x 2m x 1m, weights 1970 N in water. Find its weight in air. Find its mass.	04
	(c) Derive an equation of continuity for three dimensional Cartesian coordinate system.	07
	OR	
	(c) Derive equation of total pressure and center of pressure for vertical submerged body.	07
Q.3	(a) Classify fluid flows.	03
	(b) A stream function is given by $\psi = 5x - 6y$. Calculate magnitude and direction of resultant velocity.	04
	(c) Derive the expressions for discharge over a Triangular notch.	07
	OR	
Q.3	(a) Define path line, stream line and streak line.	03
	(b) Derive Euler's equation of motion along a stream line.	04
	(c) A horizontal Venturimeter 20 cm x 10 cm is used to measure the flow rate of oil having specific gravity 0.9. The discharge through the venturi meter is 3600 liters / minute. Find the reading of oil – mercury differential manometer. Take $C_d = 0.98$.	07
Q.4	(a) Define following non dimensional numbers: Reynold's Number, Weber's Number, Froude's Number	03
	(b) List out minor losses for flow through pipe and explain any one in detail.	04
	(c) For viscous flow through pipe, derive equation of velocity distribution and prove that ratio of maximum velocity to average velocity for this flow is 2.	07
	OR	
Q.4	(a) Explain the phenomenon of water hammer.	03
	(b) An aeroplane is flying at an height of 15 km where the temperature is -50°C . Speed of the plane is corresponding to $M = 2$. Assuming $k = 1.4$ and $R = 287$ j/kg K, find the speed of the plane.	04

- (c) The pressure difference ΔP in a pipe of diameter D and length L due to turbulent flow depends upon the velocity, density and roughness. Using Buckingham's π theorem obtain expression of ΔP . **07**
- Q.5** (a) Determine the head lost due to friction in a pipe using Chezy's formula. Diameter and length of pipe = 300 mm and 50 m Velocity of water flowing in pipe = 2.5 m/s Chezy's constant = 60 **03**
- (b) What are repeating variables? How are they selected for dimensional analysis? **04**
- (c) Prove the velocity of a sound wave in a compressible fluid is given by $C = \sqrt{\frac{dP}{d\rho}}$ **07**

OR

- Q.5** (a) Distinguish between free vortex flow and forced vortex flow. **03**
- (b) A crude oil of viscosity 0.1Ns/m^2 and relative density 0.9 is flowing through a horizontal circular pipe of diameter 60 mm and length 200 m. calculate the difference of pressure at the two ends of the pipe if flow rate through the pipe is 4 liters/s. **04**
- (c) Derive Darcy-Weisbach equation for head loss due to friction in pipe flow. **07**
