

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-III (NEW) - EXAMINATION – SUMMER 2017****Subject Code: 2130101****Date: 02/06/2017****Subject Name: Fundamentals of Fluid Mechanics****Time: 10:30 AM to 01:00 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	Short Questions	14
	1 Define surface tension.	
	2 State Pascal's law.	
	3 State expression for meta-centric height of a floating body.	
	4 Define Mech Number.	
	5 Define Buoyancy.	
	6 State Continuity equation in differential form.	
	7 What are the assumption made in derivation of Bernoulli's equation?	
	8 Define Streak line.	
	9 Define Weber's Number.	
	10 What do you mean by distorted and undistorted models?	
	11 What do you mean by viscous flow?	
	12 What is Hagen Poiseuille's Formula?	
	13 What do you mean by dimensionless number?	
	14 Define Hydrostatic Paradox.	
Q.2	(a) Draw a sketch of viscometer and explain how the device is used to find the viscosity of a fluid.	03
	(b) What is pitot tube? How will you determine the viscosity at any point with the help of pitot tube?	04
	(c) A block of wood of specific gravity 0.7 floats in water. Determine the meta-centric height of block if size is 2 m x 1 m x 0.8 m.	07
	OR	
	(c) A pipe of 300 mm diameter conveying 0.30 m ³ /s of water has a right angled bend in a horizontal plane. Find the resultant force exerted on the bend if the pressure at inlet and outlet of the bend are 24.525 N/cm ² and 23.544 N/cm ² .	07
Q.3	(a) What are the condition of equilibrium of a floating body and submerged body?	03
	(b) What is the difference between U-tube differential manometers and inverted U-tube differential manometer? Where are they used?	04
	(c) State Hydrostatic law. Derive equation for variation of pressure vertically for a fluid under gravity.	07
	OR	
Q.3	(a) Compare venture meter and orifice meter.	03
	(b) The stream function for a flow field is given by $\Psi = 2xy$. Show that the flow is continuous and irrotational.	04

- (c) Derive momentum equation for 2D and 3D in Cartesian coordinate system with suitable assumption. **07**
- Q.4** (a) What do you mean by cavitation? What are the effect of cavitation? **03**
- (b) How to determine co-efficient of velocity experimentally? **04**
- (c) An oil of viscosity 5 poise is used for lubrication between a shaft and sleeve. The diameter of the shaft is 0.5 m and it rotates at 200 r.p.m. Calculate the power lost in oil for a sleeve length of 100 mm. The thickness of oil film is 1.0 mm. **07**
- OR**
- Q.4** (a) Explain how the principal of floatation differs from the principal of buoyancy? **03**
- (b) Give the dimensions in MLT system for the following. **04**
- (i) Surface tension
- (ii) Momentum
- (iii) Angular acceleration
- (iv) Dynamic viscosity
- (c) An oil of specific gravity 0.9 and viscosity 0.06 poise is flowing through a pipe of diameter 200 mm at the rate of 60 liters/s. Find the head lost due to friction for a 500 m length of pipe. Find the power required to maintain this flow. **07**
- Q.5** (a) Differentiate between a dimensionless constant and dimensioned constant. Give example. **03**
- (b) Show that the value of the co-efficient of friction for viscous flow through a circular pipe is given by $16/R_e$, Where R_e = Reynolds Number **04**
- (c) The pressure difference Δp in a pipe of diameter D and length l due to turbulent flow depends on the velocity v, viscosity μ , density ρ and roughness k. Using Buckingham's π -theorem, obtain expression for Δp . **07**
- OR**
- Q.5** (a) What are the fields of application of Froude's law and Reynolds's law. **03**
- (b) Describe Reynolds's experiments to demonstrate the two types of flow. **04**
- (c) Derive on the basis of dimensional analysis suitable parameter to present the thrust developed by a propeller. Assume that the thrust P depends upon the angular velocity ω , speed of advance V, diameter D, dynamic viscosity μ , mass density ρ , elasticity of fluid medium which can be denoted by the speed of sound in medium C. **07**
