Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–III (New) EXAMINATION – WINTER 2018

Subject Code: 2130602 Date:05/12/2018

Subject Name: 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.**

Q.1	**(a)**	Define the following terms: (1) Viscosity (2) Surface tension (3) Elasticity	**03**
	(b)	Explain hydrostatic paradox? Explain with figure.	**04**
	(c)	Derive Euler's equation of motion. State assumptions also.	**07**
Q.2	**(a)**	What is Pitot tube? Derive equation of velocity for flow of fluid through it.	**03**
	(b)	Explain piezometer and U-tube manometer with a neat sketch.	**04**
	(c)	State Pascal's law and of pressure and prove it.	**07**
		OR	
	(c)	Derive theoretical equation for the metacentric height of a floating body.	**07**
Q.3	**(a)**	Define: (1) Vorticity (2) Circulation (3) Newtonian Fluid	**03**
	(b)	Explain the different types of flow.	**04**
	(c)	Derive Bernoulli's equation for incompressible fluid flow. State assumptions made in the derivation.	**07**
		OR	
Q.3	**(a)**	Explain Magnus effect.	**03**
	(b)	Derive expression for rate of flow through Venturimeter.	**04**
	(c)	Derive Continuity Equation in three dimensional flow.	**07**
Q.4	**(a)**	What is weir? How it different from a notch.	**03**
	(b)	Explain characteristics of airfoil.	**04**
	(c)	An empty tank (with all sides closed) is rectangular in plan, side elevation and end elevation with sides 12.5 m long, 0.7 m broad and 0.6 m high. If the sheet metal weighs 363N/m^2 of the surface and the tank is allowed to float in fresh water with 0.6 m edges vertical, prove that the equilibrium is stable or otherwise. Derive the equation you may use. Weight of water is 9810 N/m^3.	**07**
		OR	
Q.4	**(a)**	Define coefficient of contraction, coefficient of velocity and coefficient of discharge for the orifice.	**03**
	(b)	State and define the different types of fluid flow.	**04**
	(c)	Derive an expression for the depth of center of pressure for inclined plane surface submerged in the liquid.	**07**
Q.5	**(a)**	Define: Stream line, Equipotential line, Stream tube	**03**
	(b)	Distinguish between laminar flow and turbulent flow in pipes.	**04**
	(c)	Given the velocity field: $V = (6 + 2xy + t^2)\ i - (xy^2 + 10t)\ j + 25k$. What is the acceleration of a particle at (3, 0, 2) at time t = 1?	**07**
		OR	
Q.5	**(a)**	Explain term metacentre and metacentric height.	**03**
	(b)	What are the advantages of triangular notch over a rectangular notch?	**04**
	(c)	Derive equation for sonic velocity of sound wave in a compressible fluid in terms of the bulk modulus of elasticity of the fluid medium.	**07**