Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–III (New) EXAMINATION – WINTER 2015

Subject Code:2130602 **Date:29/12/2015**

Subject Name: Fluid Mechanics

Time: 2:30pm to 5:00pm **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	What is Magnus effect?	
	3	State Newton's law of viscosity.	
	4	Define specific gravity.	
	5	Define metacentric height.	
	6	Define stream line.	
	7	State Bernoulli's theorem.	
	8	Define drag and lift.	
	9	Define elasticity.	
	10	State Archimede's principle.	
	11	Define total pressure and center of pressure.	
	12	Define circulation.	
	13	Define co-efficient of discharge.	
	14	What is the value of atmospheric pressure head in terms of water column?	
Q.2	**(a)**	What is hydrostatic paradox? Explain with figure.	**03**
	(b)	A 150mm diameter shaft rotates at 1500rpm in a 200 mm long journal bearing with 150.5 mm internal diameter. The uniform annular space between the shaft and the bearing is filled with oil of dynamic viscosity 0.8 Poise. Calculate the power dissipated as heat.	**04**
	(c)	Explain construction and working of vertical and inclined single column manometer with equation.	**07**
		OR	
	(c)	Explain construction and working of Bourdon tube pressure gauge.	**07**
Q.3	**(a)**	Derive generalized equation of total pressure on inclined plane surface.	**03**
	(b)	An isosceles triangle of base 3m and altitude 6m, is immersed vertically in water, with its axis of symmetry horizontal. If the head of water on it is 9m, Determine (i) total pressure on plate ,(ii) The position of center of pressure.	**04**
	(c)	State and define different types of fluid flow.	**07**
		OR	
Q.3	**(a)**	A rectangular pantoon is 5m long, 3m wide and 1.2m high. The depth of immersion is 0.8m in sea water. If the center of gravity is 0.6m above the bottom of pantoon,	**03**

determine the metacentric height. Take density of sea water as 1025 kg per meter cube.

	(b)	Derive expression for rate of flow through venturimeter	**04**
	(c)	Derive the equation of pressure at the bottom of the container when liquid in it is subjected to uniform acceleration in vertically upward and downward direction.	**07**
Q.4	**(a)**	What is Pitot tube? Derive equation of velocity for flow of fluid through it.	**03**
	(b)	A stream function for a two dimensional flow is given by $\psi = 2xy$, calculate the velocity at point P (2,3). Find the velocity potential function ϕ.	**04**
	(c)	Derive Bernoulli's equation from Euler's equation of motion. State assumptions also.	**07**

OR

Q.4	**(a)**	Explain possibilities of dam failure in short.	**03**
	(b)	Derive the equation of discharge over a rectangular notch.	**04**
	(c)	Prove that velocity of sound wave is square root of the ratio of change of pressure to the change of density of the fluid	**07**
Q.5	**(a)**	Explain working of rotameter with figure.	**03**
	(b)	Define Mach number and various flow on its basis	**04**
	(c)	An aero plane weighing 40 kN is flying in a horizontal direction at 360 km/hr. The plane spans 15m and has a wing surface area of 35 m^2. Determine the lift coefficient and the power required to drive the plane. Assume drag coefficient =0.3 and for air $\rho = 1.20$ kg/m^3. Also work out the theoretical value of the boundary layer circulation.	**07**

OR

Q.5	**(a)**	Define various parts of an aerofoil.	**03**
	(b)	A reservoir discharges through a sluice 0.915m wide by 1.22m deep. The top of the opening is 0.65m below the water level in the reservoir and the downstream water level is below the bottom of the opening. Calculate (i) the discharge through the opening if Cd= 0.6 and (ii) % error if the opening is treated as a small orifice.	**04**
	(c)	Derive equation of discharge through a convergent-divergent mouthpiece.	**07**

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