Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER– IV EXAMINATION – SUMMER 2020

Subject Code: 3140611 **Date:04/11/2020**

Subject Name: Fluid Mechanics & Hydraulics

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 density, specific volume & surface tension.	**03**
	(b)	The velocity distribution for flow over a flat plate is given by $u = 0.75\ y - y^2$ in which u is the velocity in metre per second at a distance y metre above the plate. Determine the shear stress at y = 0.20 m. Take dynamic viscosity of fluid as 8.0 poise.	**04**
	(c)	Explain the phenomenon of capillarity.Obtain an expression for capillary rise of a liquid.	**07**
Q.2	**(a)**	Define atmospheric, absolute & vaccum pressure.	**03**
	(b)	Explain hydrostatic paradox.	**04**
	(c)	Write short note on manometers.	**07**
		OR	
	(c)	State & prove Pascal's law.	**07**
Q.3	**(a)**	Define total pressure, centre of pressure & buoyancy.	**03**
	(b)	A rectangular plane surface is immersed vertically in water such that its upper edge is touching free surface of liquid. Show that the depth of centre of pressure is 2/3 d for rectangular surface of width b and depth d.	**04**
	(c)	Define metacentre & metacentric height. How will you determine metacentric height of a floating body experimentally? Explain with neat sketch.	**07**
		OR	
Q.3	**(a)**	Define stream lines, streak lines & flow net.	**03**
	(b)	Differentiate between (i) Uniform & non uniform flow (ii) Sub critical & super critical flow.	**04**
	(c)	State & prove Bernoulli's equation & write assumption made for such a derivation.	**07**
Q.4	**(a)**	Define orifice, mouthpiiece & notches.	**03**
	(b)	Find the discharge of water flowing over a rectangular notch of 2.0 m length when the constant head over the notch is 500 mm.Take C_d = 0.62	**04**
	(c)	Differrentiate between small & large orifice.Obtain an expression for discharge through large orifice.	**07**
		OR	
Q.4	**(a)**	Define major energy losses in pipe, hydraulic gradient line & total energy line.	**03**
	(b)	Three pipes of lengths 800 m, 500 m and 400 m and of diameters 500 mm, 400 mm & 300 mm respectively are connected in series. These pipes are to be replaced by a single pipe of length 1700 m. Find the diameter of the single pipe.	**04**
	(c)	Define viscous flow. Derive expression for Hagen-Poiseuille's formula.	**07**

Q.5	**(a)**	Define turbulent flow in open channel, specific energy curve & hydraulic jump.	**03**
	(b)	A sluice get discharges water into a horizontal rectangular channel with a velocity of 10 m/sec & depth of flow of 1 m.Determine the depth of flow after the jump & consequent losses in total head.	**04**
	(c)	Define gradually varied flow. Derive equation of gradually varied flow.	**07**

OR

Q.5	**(a)**	Define dimensional homogeneity, similitude & undistorted models	**03**
	(b)	Explain method of selecting repeating variables.	**04**
	(c)	The pressure difference Δp in a pipe of diameter D and length l due to viscous flow depends on the velocity V, viscosity μ & *density* ρ. Using Buckingham's π theorem obtain an expression for Δp.	**07**