Enrolment No./Seat No_____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–IV (NEW) EXAMINATION – SUMMER 2024

Subject Code:3140611 Date:03-07-2024

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.**
4. **Simple and non-programmable scientific calculators are allowed.**

			MARKS
Q.1	**(a)**	Define Non-Uniform flow, Supercritical Flow, RVF	**03**
	(b)	Compare flow discharge measurement by Notch and weir.	**04**
	(c)	State and explain the theorems associated with dimensional analysis.	**07**
Q.2	**(a)**	Define Venturimeter, Orificemeter, and Weir.	**03**
	(b)	What is Orifice? What are the different hydraulic coefficients associated with orifice.	**04**
	(c)	A horizontal Venturimeter with inlet diameter 25 cm and throat diameter 15 cm is used to measure the flow of oil of specific gravity 0.8. The discharge of oil through Venturimeter is 70 litres/s. Find the reading of the oil-mercury differential manometer. Take Cd as 0.97	**07**
		OR	
	(c)	The head of water over a triangular notch of angle 60^0 is 55 cm and co-efficient of discharge is 0.61. The flow measured by it is to be within an accuracy of 1.7 % up or down. Find the limiting values of the head.	**07**
Q.3	**(a)**	Define Unsteady Flow, Flow Net, Metacentric Height.	**03**
	(b)	State Bernoulli's Theorem with equation. Explain its significance.	**04**
	(c)	A solid cylinder of diameter 5 m has a height of 5 m. Find the metacentric height of the cylinder if the specific gravity of the material of cylinder is 0.6 and it is floating in the water with its axis vertical. State whether the equilibrium is stable or unstable.	**07**
		OR	
Q.3	**(a)**	Define Specific Gravity, Centre of Pressure, Viscosity.	**03**
	(b)	State and prove Pascal's law with suitable sketch.	**04**
	(c)	A U-tube manometer is used to measure the pressure of the water in a pipe line, which is in excess of the atmospheric pressure. The right limb of the manometer contains mercury and is open to atmosphere. The contact between the water and mercury is in the left limb. Determine the pressure of the water in the main line, if the difference in the level of mercury in the limbs of U-tube is 15 cm and the free surface of mercury is in level with the centre of the pipe.	**07**
Q.4	**(a)**	Describe the Prandtl's mixing length theory with suitable sketch,	**03**
	(b)	Derive the energy-momentum equation.	**04**
	(c)	Discuss various major and minor losses in pipes.	**07**

OR

Q.4	**(a)**	Write the continuity equation, momentum equation and Energy equation for the pipe flow.	**03**
	(b)	Derive the Hagen Poiseuille equation.	**04**
	(c)	Discuss Hardy Cross method to analyze pipe networks in series and parallel.	**07**
Q.5	**(a)**	Describe the velocity distribution in an open channel flow.	**03**
	(b)	What is Specific Energy. Derive the specific energy equation.	**04**
	(c)	Find the discharge through a trapezoidal channel of width 8 m and side slope of 1 horizontal to 3.5 vertical. The depth of flow of water is 1.9 m and the value of Chezy's constant, C=45. The slope of the bed of the channel is given 1 in 5000.	**07**

OR

Q.5	**(a)**	Discuss direct step method for GVF.	**03**
	(b)	Write down the Chezy's equation and Manning's equation along with their assumptions.	**04**
	(c)	The discharge of water through a rectangular channel of width 10 m, is 18 m^3/s when depth of flow of water is 1.4 m. Calculate: i) Specific energy of the flowing water ii) Critical depth and critical velocity iii) Value of minimum specific energy	**07**

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