Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–IV (NEW) EXAMINATION – WINTER 2021

Subject Code:3141906 Date:01/01/2022

Subject Name:Fluid Mechanics and Hydraulics Machines

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.**

Q.1	**(a)**	If the surface tension at air water interface is 0.069 N/m, What is the pressure difference between inside and outside of an air bubble of diameter 0.009 mm?	**03**
	(b)	Explain hydraulic similitude in model analysis.	**04**
	(c)	Derive Bernoulli's equation stating all assumptions.	**07**
Q.2	**(a)**	Discuss types of equilibrium of floating body.	**03**
	(b)	State and prove Pascal's law.	**04**
	(c)	Derive an expression for continuity for 3 D flow and reduce it for steady incompressible 2 D flow in cartesian coordinate system.	**07**
		OR	
	(c)	An annular plate 2m external diameter and 1m internal diameter with its greatest and least depths below the surface being 1.5 m and 0.75 m respectively. Calculate the magnitude, direction and location of the force acting upon one side of the plate due to water pressure.	**07**
Q.3	**(a)**	Discuss Eulerian and Lagrangian approach for description of fluid flow.	**03**
	(b)	Explain the terms: Surface tension and Compressibility.	**04**
	(c)	Explain governing of Impulse turbines.	**07**
		OR	
Q.3	**(a)**	Enlist the characteristics of a Laminar flow.	**03**
	(b)	Explain the concept of hydraulic gradient and total energy lines.	**04**
	(c)	Deduce the expression of discharge through Venturimeter with usual notations.	**07**
Q.4	**(a)**	Explain major and minor losses in a pipe flow.	**03**
	(b)	Define cavitation. How does it affect the performance of hydraulic machines?	**04**
	(c)	Deduce the expression of discharge through V notch.	**07**
		OR	
Q.4	**(a)**	Explain the function of draft tube in the case of reaction turbines.	**03**
	(b)	A Pelton wheel generates 8000 kW under a net head of 130 m at a speed of 200 r.p.m. Assuming the mechanical efficiency 75 percent and hydraulic efficiency 87 percent, determine required discharge.	**04**
	(c)	With neat sketch explain construction and working of hydraulic press.	**07**

Q.5	**(a)**	Explain phenomenon of water hammer and its effects.	**03**
	(b)	Define and explain briefly the following: (i) Velocity potential; (ii) Stream function.	**04**
	(c)	Write a short note on hydraulic intensifier.	**07**

OR

Q.5	**(a)**	A turbine is to operate under a head of 25 m at 200 r.p.m. The discharge is 9 m^3/s. If the overall efficiency is 90 per cent, determine : (i) Power generated; (ii) Specific speed of the turbine; (iii) Type of turbine.	**03**
	(b)	Discus characteristic curves of centrifugal pump.	**04**
	(c)	With neat sketch explain construction and working of hydraulic accumulator.	**07**

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