

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: **04**
(i) Velocity potential; (ii) Stream function.
- (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 **03**
 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.
- (b)** Discuss characteristic curves of centrifugal pump. **04**
- (c)** With neat sketch explain construction and working of hydraulic accumulator. **07**
