

**GUJARAT TECHNOLOGICAL UNIVERSITY****BE- SEMESTER-IV (NEW) EXAMINATION – WINTER 2020****Subject Code:3141906****Date:11/02/2021****Subject Name:Fluid Mechanics and Hydraulics Machines****Time:02:30 PM TO 04:30 PM****Total Marks:56****Instructions:**

1. Attempt any FOUR questions out of EIGHT questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1** (a) If the surface tension at the soap-air interface is 0.09 N/m, calculate the internal pressure in a soap bubble of 28 mm diameter. **03**
- (b) Explain the terms: Compressibility and Bulk Modulus. **04**
- (c) State and prove Pascals's Law. **07**
- Q.2** (a) Briefly discuss Eulerian and Lagrangian approach for description of fluid flow. **03**
- (b) Discuss types of equilibrium of floating bodies. **04**
- (c) Given that  $u = xy$ ,  $v = 2yz$ . Examine whether these velocity components represent two or three-dimensional incompressible flow; if three-dimensional, determine the third component. **07**
- Q.3** (a) Define and explain briefly the following: **03**
- (i) Velocity potential; (ii) Stream function.
- (b) Explain hydraulic similitude in model analysis. **04**
- (c) Deduce the expression of discharge through Orificemeter. **07**
- Q.4** (a) What are the characteristics of a laminar flow? **03**
- (b) Explain construction and working of Rotameter. **04**
- (c) A horizontal venturimeter with inlet diameter 200 mm and throat diameter 100 mm is employed to measure the flow of water. The reading of the differential manometer connected to the inlet is 180 mm of mercury. If the co-efficient of discharge is 0.98, determine the rate of flow. **07**
- Q.5** (a) Explain water hammer and its effects. **03**
- (b) What is cavitation? How does it affect the performance of hydraulic machines? **04**
- (c) Explain governing system of any one hydraulic turbine. **07**
- Q.6** (a) What do you mean by major and minor losses in a pipe flow? **03**
- (b) Describe Reynold's experiment. **04**
- (c) The resisting force  $F$  of a plane during flight can be considered as dependent upon the length of aircraft  $l$ , velocity  $v$ , air viscosity  $\mu$ , air density  $\rho$ , and bulk modulus of air  $K$ . Express the functional relationship between these variables and the resisting force using dimensional analysis. **07**
- Q.7** (a) Find the discharge over a triangular notch of angle  $60^\circ$  when the head over the triangular notch is 0.2 m. Assume  $C_d = 0.6$ . **03**
- (b) Give classification of pumps. **04**
- (c) With neat sketch explain construction and working of hydraulic press. **07**

- Q.8** (a) A jet of water 80 mm diameter and having a velocity of 20 m/s impinges at the centre of hemispherical vane. The linear velocity of vane is 10 m/s in the direction of jet. Find the force exerted on the vane. **03**
- (b) Discuss characteristic curves of centrifugal pump. **04**
- (c) With neat sketch explain construction and working of hydraulic accumulator. **07**

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