

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER– III (New) EXAMINATION – WINTER 2019****Subject Code: 2130602****Date: 3/12/2019****Subject Name: Fluid Mechanics****Time: 02:30 PM TO 05:00 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: Fluid, Specific gravity, Specific volume **03**
- (b) State the Newton's law of viscosity and give examples of its application. **04**
- (c) State the Hydrostatic law and prove it with suitable assumption. **07**
- Q.2** (a) Calculate the specific weight, mass density and specific gravity of one litre of a liquid which weighs 8N. **03**
- (b) Differentiate between (1) Absolute and gauge pressure, (2) Ideal fluid and Real fluid. **04**
- (c) A solid cylinder of diameter 4.0 has a height of 6.0 m. Find the meta-centric height of the cylinder if the specific gravity of the material of cylinder is 0.6 and it is floating in water with its vertical axis. State whether the equilibrium is stable or unstable. **07**

OR

- (c) Two pipes A and B are connected by differential manometer. The centre of pipe B is 3.0 m lower than the centre of pipe A. The positive pressure at A and B are 98.1 KN/m² and 176.58 KN/m². The pipe A and pipe B contains a liquid of sp. Gr. of 1.5 and 0.9 respectively. Distance from centre of pipe A to mercury level in left limb = 5m. Find the difference in mercury level in the differential manometer. **07**
- Q.3** (a) Define Bouyancy and explain Archimedes Principle. **03**
- (b) Derive an expression for the force exerted on a submerged vertical plane surface by the static liquid and locate the position of centre of pressure. **04**
- (c) The following case represents the two velocity component; determine the third component of velocity such that they satisfy the continuity equation. **07**

$$u = x^2 + y^2 + z^2; \text{ and } v = xy^2 - yz^2 + xy.$$

OR

- Q.3** (a) Give the difference between (1) Steady and Unsteady flow, (2) Laminar and Turbulent flow. **03**
- (b) With neat sketch, explain the conditions of equilibrium for sub-merged bodies. **04**
- (c) Find the magnitude of the resultant force due to water acting on a roller gate of cylindrical form of 5.0m diameter, when the gate is placed on the dam in such a way that water is just going to spill. Take the length of gate is 8.0 m. **07**
- Q.4** (a) Derive the Euler's Equation of motion with suitable assumption. **03**
- (b) Explain different types of notches with their specific application. **04**
- (c) Derive an expression for discharge through fully submerged and partially submerged orifice. **07**

OR

- Q.4** (a) Give the difference between an orifice and a mouthpiece. **03**
- (b) Derive an expression for rate of flow through venturimeter. **04**
- (c) The water is flowing through a taper pipe of length 100m having diameters 700 mm at the upper end and 350 mm at the lower end, at the rate of 50 litres/s. The pipe has a slope with 1 in 30. Find the pressure at the lower end if the pressure at the higher level is 19.62 N/cm^2 . **07**
- Q.5** (a) Define: subsonic flow, supersonic flow, sonic flow **03**
- (b) Define various parts of aerofoil. **04**
- (c) Explain drag on a sphere in detail. **07**

OR

- Q.5** (a) Briefly discuss about drag force and lift force. **03**
- (b) Give the difference between (1) Compressible flow and Incompressible flow (2) Steady and Unsteady flow. **04**
- (c) State the Bernoulli's theorem for compressible flow and derive Bernoulli's equation when the process is isothermal. **07**
