Seat No.: _____ Enrolment No._____

# GUJARAT TECHNOLOGICAL UNIVERSITY

**BE - SEMESTER–III(New) • EXAMINATION – WINTER 2016**

**Subject Code:2130101** **Date:04/01/2017**

**Subject Name:Fundamentals of Fluid Mechanics**

**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.**

**MARKS**

**Q.1** **Short Questions** **14**

**1** The pressure less than atmospheric pressure is known as
(a) Suction pressure (b) Vacuum pressure (c) Negative gauge pressure
(d) All of these

**2** The center of gravity of the volume of the liquid displaced is called
(a) Center of pressure (b) Center of buoyancy (c) Metacenter
(d) All of these

**3** Reynold's number is the ratio of inertia force to
(a) Pressure force (b) Elastic force (c) Gravity force (d) Viscous force

**4** The weight per unit volume of a liquid at a standard temperature and pressure is called
(a) Specific Weight (b) Mass density (c) Specific Gravity (d) None of these

**5** The venturi-meter is used to measure
(a) Flow through a pipe (b) Flow through a canal
(c) Flow through a river (d) None of the above

**6** The fundamental unit of pressure is known as
(a) Pascal (b) Poise (c) Stoke (d) None of the above

**7** The rain drop of water is spherical because of
(a) Surface tension of water (b) Capillarity of water
(c) Incompressibility of water (d) None of the above

**8** The value of normal atmospheric pressure is
(a) 76 cm of Hg (b) 10.33 m of water (c) 1.01325 bar (d) All of the above

**9** In steady flow, the velocity
(a) Does not change from place to place (b) Does not change with time
(c) Both (a) and (b) (d) None of the above

**10** The length of the divergent portion of venture-meter in comparison to convergent portion is
(a) More (b) less (c) same (d) less or more

**11** Continuity equation deals with the law of conservation of
(a) Energy (b) mass (c) momentum (d) all of the above

**12** The energy loss in flow through orifice as compared to venturi-meter is
(a) Same (b) less (c) more or less depending on flow (d) more

**13** For pipes, Laminar flow occurs when Reynolds's number is
(a) Less than 2000 (b) Greater than 2000
(c) between 2000 & 4000 (d) None of the above

**14** A fluid is said to be Newtonian if fluid
(a) is highly viscous (b) is incompressible and non-viscous
(c) obeys Newton's law of viscosity (d) is compressible and non-viscous

**Q.2** **(a)** Define viscosity and differentiate between kinematic and dynamic viscosity. **03**

**(b)** Describe the terms atmospheric, absolute, gauge and vacuum **04**

pressure with neat sketch.

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| | **(c)** | State and prove Pascal's law. | **07** |

**OR**

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| | **(c)** | How will you determine the metacentric height of a floating body experimentally? Explain with neat sketch. | **07** |
| **Q.3** | **(a)** | What is pressure head? How it can be expressed in terms of height of a liquid column? | **03** |
| | **(b)** | A rectangular plane surface is 2 m wide and 4 m deep. It lies vertically plane in water. Determine the total pressure and position of center of pressure on the plane surface when upper edge is horizontal and 2.5 m below the free surface. | **04** |
| | **(c)** | Discuss the stability of submerged body and floating body with neat sketch. | **07** |

**OR**

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| **Q.3** | **(a)** | Define center of pressure, vapor pressure and buoyancy. | **03** |
| | **(b)** | The two velocity components are given and from that determine the third component of velocity such that they satisfy the continuity equation: $v = 2y^2$, $w = 2xyz$ | **04** |
| | **(c)** | Derive expression of continuity equation for a three dimensional equation. | **07** |
| **Q.4** | **(a)** | Define path line, stream line and streak line. | **03** |
| | **(b)** | The diameters of tapering pipe are 10 cm at one end and 20 cm at other end. If water is entering through 10 cm diameter with a velocity of 2 m/s. Find discharge through pipe and velocity of water at other end. | **04** |
| | **(c)** | What is venture-meter? Derive an expression for discharge through a venture-meter. | **07** |

**OR**

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| **Q.4** | **(a)** | Differentiate between one dimensional, two dimensional and three dimensional flow. | **03** |
| | **(b)** | What is pitot tube? How the velocity at any point is determined with the help of pitot tube? | **04** |
| | **(c)** | Write Euler's equation of motion for a steady and incompressible fluid. Derive an expression for Bernoulli's theorem from Euler's equation. Clearly state assumptions made. | **07** |
| **Q.5** | **(a)** | What do you understand by fundamental units and derived units? Illustrate with example. | **03** |
| | **(b)** | What do you understand by repeating variables? How the repeating variables are selected in dimensional analysis technique. | **04** |
| | **(c)** | What do you understand by similarity? Mention various similarities which are to be maintained for model testing. | **07** |

**OR**

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| **Q.5** | **(a)** | State Buckingham's theorem and mention the advantages of dimensional analysis. | **03** |
| | **(b)** | What is Reynold's Number? Explain Reynold's Experiment. | **04** |
| | **(c)** | Derive Hagen-Poiseuille equation for laminar flow in the circular pipe. | **07** |

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