

**GUJARAT TECHNOLOGICAL UNIVERSITY****BE - SEMESTER– III (New) EXAMINATION – WINTER 2019****Subject Code: 3133608****Date: 3/12/2019****Subject Name: Basics of Fluid Flow****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.

|  | <b>Marks</b> |
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| <b>Q.1</b> (a) State Newton's law of Viscosity? Mention classification of fluids based on Newton's law of viscosity.   | <b>03</b>    |
| (b) With suitable diagrams correlate gauge pressure, atmospheric pressure and vacuum pressure  | <b>04</b>    |
| (c) Discuss the case of boundary layer separation for the case of fluid flowing over a flat plate  | <b>07</b>    |
| <b>Q.2</b> (a) Differentiate between laminar flow and turbulent flow.  | <b>03</b>    |
| (b) Water is flowing in a pipe of 25mm ID at the rate of 1000 kg/min. Calculate the Reynolds number and find the type of flow.   | <b>04</b>    |
| (c) Derive a relationship to measure the pressure drop between two points in case of fluid flowing through a pipeline.   | <b>07</b>    |
| <b>OR</b>  |              |
| (c) A simple U-tube manometer is installed across an orifice meter. The manometric fluid is mercury (having sp.gr.13.6) and flowing fluid through piping is carbon tetrachloride (sp.gr.1.6). The manometer reads 200 mm. What is the pressure difference over a manometer in N/m <sup>2</sup>   | <b>07</b>    |
| <b>Q.3</b> (a) Discuss differences between skin friction and form friction?  | <b>03</b>    |
| (b) Convert pressure head of mercury into equivalent pressure head of water  | <b>04</b>    |
| (c) With a neat sketch explain the main parts, design aspects and working principle of Venturimeter? Derive the equation of discharge for Venturimeter.  | <b>07</b>    |
| <b>OR</b>  |              |
| <b>Q.3</b> (a) Mention the relationship between skin friction and wall shear.  | <b>03</b>    |
| (b) Determine the vacuum pressure in meter of water if the absolute pressure is 0.622001 bar. Assume the atmospheric pressure as 10.33 meter of water.   | <b>04</b>    |
| (c) An orifice meter consisting of 100mm diameter orifice in a 250mm diameter pipe has a $C_d = 0.65$ . The pipe delivers oil of specific gravity 0.8. The pressure difference on two sides of the orifice plate is measured by a mercury oil differential manometer. If the differential gauge reading is 800 mm of mercury, find the rate of flow in liters/sec. | <b>07</b>    |
| <b>Q.4</b> (a) List various types of valves and mention their specific application in chemical industry.   | <b>03</b>    |

- (b) Explain what is cavitation and when priming is required in centrifugal pump? **04**
- (c) What is Fluidization? Derive an expression for minimum fluidization velocity from first principles? **07**
- OR**
- Q.4** (a) What is static head, dynamic head and total head? Mention the relationship between them. **03**
- (b) With a neat diagram mention various types of heads in a pump. **04**
- (c) A circular disc of 2m in diameter is held against a wind stream at a velocity of 30m/s and having a density of 1.2 kg/m<sup>3</sup>. Calculate the drag force exerted by wind on the disc. Assume the drag coefficient of disc is 1.2 **07**
- Q.5** (a) What is meant by Streamline? How it is different from a streamtube? **03**
- (b) Explain the concept of flow in non-circular cross sections **04**
- (c) Derive the expression to estimate the pressure drop for the flow of fluid for a specific length of pipe. **07**
- OR**
- Q.5** (a) Explain the concept of momentum correction factor. **03**
- (b) What is understood by Hydraulically smooth condition? **04**
- (c) Describe the case of various kind of skin and frictional losses for the flow of fluid in a pipe. **07**

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