

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-VI (NEW) EXAMINATION – SUMMER 2023****Subject Code:2160602****Date:06-07-2023****Subject Name:Applied 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.
4. Simple and non-programmable scientific calculators are allowed.

- Q.1**
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|------------|--|-----------|
| (a) | Enlist types of losses in pipes. | 03 |
| (b) | Write the differences between pipe flow and open channel flow? | 04 |
| (c) | Derive the Darcy-Weisbach equation for calculating head loss due to friction | 07 |

- Q.2**
- | | | |
|------------|--|-----------|
| (a) | Explain hydraulically smooth and rough pipes | 03 |
| (b) | Define boundary layer, laminar sub-layer, displacement thickness and momentum thickness | 04 |
| (c) | A horizontal pipe of diameter 500 mm is suddenly contracted to diameter of 250 mm. The pressure intensity in larger and smaller pipes are given as 18.5 N/cm ² and 12.5 N/cm ² . If $C_c = 0.62$ find loss of head due to sudden contraction and discharge of water formula for the loss of head due to friction in pipe line. | 07 |

OR

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|------------|--|-----------|
| (c) | Calculate the head loss due to friction using Darcy Equation and power required to maintain 50 liters per second of liquid flow through a steel pipe 0.08 m radius and 750 m long. Take Sp. Gravity of the liquid = 0.80 and co-efficient of friction $f=0.0025$. | 07 |
|------------|--|-----------|

- Q.3**
- | | | |
|------------|---|-----------|
| (a) | Write the assumptions made in derivation of the Dynamic Equation of the Gradually varied flow | 03 |
| (b) | Explain the Manning's formula in open channel flow | 04 |
| (c) | Design the optimum trapezoidal channel has side slopes of 3 horizontal to 4 vertical and slope of its bed is 1 in 2500, if it is to carry water at 0.7 m ³ /s. Take Chezy's constant as 60 | 07 |

OR

- Q.3**
- | | | |
|------------|---|-----------|
| (a) | Define
(i) Cavitation (ii) Prandtl Mixing length (iii) Water Hammer | 03 |
| (b) | Enlist the important applications of Navier-stoke equations | 04 |
| (c) | Explain with diagram the Specific Energy Curve and Discharge Curve and derive the mathematical expression for minimum specific energy and maximum discharge in terms of depth of flow | 07 |

- Q.4**
- | | | |
|------------|---|-----------|
| (a) | What is priming? Why is it necessary in centrifugal pump? | 03 |
| (b) | Discuss the phenomenon of boundary layer separation. | 04 |
| (c) | Explain the principal and working of a centrifugal pump with a neat sketch. | 07 |

OR

- Q.4** (a) Derive the expression for displacement thickness. **03**
(b) Define hydraulic jump? Discuss the types of jump based on Froude number **04**
(c) Prove that for the most economic section of a trapezoidal channel is: “half of the top width is equal to one of the sloping sides” **07**
- Q.5** (a) Define: Mechanical efficiency and Hydraulic efficiency **03**
(b) Compare Impulse turbine and Reaction Turbine. **04**
(c) Explain construction and working of a pelton wheel **07**
- OR**
- Q.5** (a) Discuss briefly various similarities between the model and the prototype. **03**
(b) Discuss the Distorted and Undistorted Models. What are the merits and demerits of Distorted Models? **04**
(c) Explain the Buckingham’s π - theorem for dimensional analysis **07**
