

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-VI (NEW) EXAMINATION – SUMMER 2024****Subject Code: 3160312****Date:20-05-2024****Subject Name: Computational fluid dynamics in Biomedical Systems****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** (a) Explain the Fahraeus - Lindqvist effect. **03**
- (b) Write a short note on Navier-Stokes equations. **04**
- (c) Enlist and explain the differences between Lagrangian and Eulerian description of fluid motion. **07**

- Q.2** (a) Explain the classification of fluids. **03**
- (b) Explain the following terms: 1) Static 2) Kinetic 3) Viscosity 4) Non-newtonian fluid **04**
- (c) What is Bernoulli's equation? Explain its physiological and clinical relevance **07**

OR

- (c) Describe in detail the Bio viscoelastic fluids. **07**

- Q.3** (a) Write a short note on CFD analysis of blood pump. **03**
- (b) Describe the blood vessel mechanics with neat diagram. **04**
- (c) Explain in detail the blood rheology. **07**

OR

- Q.3** (a) What is non viscoelastic fluid? **03**
- (b) Describe the unstructured mesh systems and its properties for computational fluid dynamics. **04**
- (c) Write a short note on use of computational fluid dynamics in the human respiratory system. **07**

- Q.4** (a) Briefly explain, why do we use computational fluid dynamics? **03**
- (b) Describe Euler's equation. **04**
- (c) Write a note on principle and applications of Finite Element Method (FEM). **07**

OR

- Q.4** (a) Explain computational fluid dynamics. **03**
(b) What are microfluidic devices used for? **04**
(c) Describe in detail the principle and applications of Finite Difference Method (FDM). **07**

- Q.5** (a) What are the basic properties of fluid? **03**
(b) Describe the principle and applications of Finite Volume Method (FVM). **04**
(c) Explain in detail, how is computational fluid dynamics useful in analysis of the human circulation? **07**

OR

- Q.5** (a) Explain the applications of computational fluid dynamics. **03**
(b) Describe in detail the reynolds transport theorem. **04**
(c) How is structured mesh systems and its properties provide better convergence for computational fluid dynamics? **07**
