

GUJARAT TECHNOLOGICAL UNIVERSITY

BE- SEMESTER- VI EXAMINATION – SUMMER 2026

Subject Code:3161915

Date:05-06-2026

Subject Name: Computational Fluid Dynamics

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) | What are the applications of CFD? | 03 |
| (b) | Explain the momentum equation in conservation form. | 04 |
| (c) | Difference between FVM, FDM and FEM. | 07 |
- Q.2**
- | | | |
|-----|---|-----------|
| (a) | List down the advantages of CFD over experimental methods. | 03 |
| (b) | Explain with an example how computational fluid dynamics is useful as a powerful research tool. | 04 |
| (c) | Explain the different boundary conditions used in CFD. | 07 |
- OR**
- | | | |
|-----|---|-----------|
| (c) | What is Discretization? Why it is required? List the basic discretization techniques. | 07 |
|-----|---|-----------|
- Q.3**
- | | | |
|-----|--|-----------|
| (a) | Justify: Implicit methods are unconditionally stable. | 03 |
| (b) | Explain advantages and disadvantages of implicit approach. | 04 |
| (c) | Derive the stability criteria for unsteady one dimensional heat transfer phenomena and list the assumptions. | 07 |
- OR**
- Q.3**
- | | | |
|-----|---|-----------|
| (a) | What is Tridiagonal matrix algorithm method? | 03 |
| (b) | Discuss ADI scheme. | 04 |
| (c) | Derive an expression for unsteady state 2-D heat conduction equation in Cartesian coordinates by using Explicit approach. | 07 |
- Q.4**
- | | | |
|-----|---|-----------|
| (a) | Write a short note on Reynolds transport theorem. | 03 |
| (b) | Write a note on “False diffusion” | 04 |
| (c) | Discuss about 1-D Convection Diffusion equation by using upwind scheme. | 07 |
- OR**
- Q.4**
- | | | |
|-----|---|-----------|
| (a) | Difference between One and Two equation models in turbulence modeling. | 03 |
| (b) | Give the difference between collocated grid and staggered grid. | 04 |
| (c) | What is turbulence motion and how it could be captured with DNS, LES and RANS models. | 07 |
- Q.5**
- | | | |
|-----|---|-----------|
| (a) | Write a note on SIMPLE Algorithm. | 03 |
| (b) | Explain Reynold’s time averaging concept of turbulence. | 04 |
| (c) | Write a short note on Lax-Wendroff technique. | 07 |
- OR**
- Q.5**
- | | | |
|-----|---|-----------|
| (a) | Difference between One and Two equation models in turbulence modeling. | 03 |
| (b) | Write notes on Commercial CFD packages | 04 |
| (c) | Explain the method of solving an incompressible flow problem using stream function vorticity formulation. | 07 |
