

Exam. Code: 0944

Sub. Code: 33909

2056

B.E. (Mechanical Engineering)

Eighth Semester

MEC-803: Computational Fluid Dynamics

Time allowed: 3 Hours

Max. Marks: 50

**NOTE:** Attempt five questions in all, including Question No. I which is compulsory and selecting two questions from each Section. Make labelled sketches, wherever applicable.

x-x-x

|                                              |                                                                                                                                                                                                                                                                                                                 |              |
|----------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|
| 1                                            | i. Distinguish conservation and non-conservation forms of fluid flow.<br>ii. What is discretization and round-off error?<br>iii. What is first order upwind scheme?<br>iv. What are different errors which are crept in Finite difference method?<br>v. What is the special characteristic of Thomas Algorithm? | (2x5<br>=10) |
| <b>Section A (Attempt any two questions)</b> |                                                                                                                                                                                                                                                                                                                 |              |
| 2                                            | a) How CFD correlates different physical principles, flow models, governing fluid equations and different boundary conditions. Explain with the help of sketch.<br>b) What are the applications of Computational Fluid Dynamics?                                                                                | 5<br>5       |
| 3                                            | a) Explain momentum equation for infinitesimally fluid element.<br>b) Explain the four different models of flow.                                                                                                                                                                                                | 7<br>3       |
| 4                                            | a) Explain the finite difference equation for Laplace equation using central difference approximation.<br>b) What are the discretization techniques? How can we discretize the equations for subsonic and supersonic flows?                                                                                     | 5<br>5       |
| <b>Section B (Attempt any two questions)</b> |                                                                                                                                                                                                                                                                                                                 |              |
| 5                                            | a) Explain and differentiate FDM and FVM method of discretization. What is the practical application of finite volume method.<br>b) Explain stability, accuracy and consistency in context of different discretization schemes in finite volume method.                                                         | 5<br>5       |
| 6.                                           | a) What is quadratic upwind scheme? Where it is more useful?<br>b) When and how we use the concept of stretched grids?                                                                                                                                                                                          | 5<br>5       |
| 7                                            | a) Explain the concepts involved in SIMPLER algorithm along with its advantages and disadvantages.<br>b) How staggered grid is implemented for pressure equation?                                                                                                                                               | 5<br>5       |

x-x-x