CBCS SCHEME

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18AE72

# Seventh Semester B.E. Degree Examination, Feb./Mar. 2022
## Computational Fluid Dynamics

Time: 3 hrs. Max. Marks: 100

**Note:** ***Answer any FIVE full questions, choosing ONE full question from each module.***





### Module-1

1 a. Derive the relation for momentum equation in Integral form for steady, Inviscid and Nobody forces. **(10 Marks)**

b. Explain about philosophy of CFD and application of CFD in Aeronautical and Aerospace Engineering. **(10 Marks)**

**OR**

2 a. Derive the relation for Energy equation in differential form for No heat addition and no body forces. **(10 Marks)**

b. Explain :
i) Shock capturing and shock fitting methods
ii) Dirichlet and Neumann Boundary conditions. **(10 Marks)**

### Module-2

3 a. How does a quasi-linear partial differential equation is classified? Explain it using Cramer's rule. **(10 Marks)**

b. Explain the following with relevant sketch.
i) Steday Inviscid Supersonic flow
ii) Steady Boundary layer flow. **(10 Marks)**

**OR**

4 a. Discuss about Jacobean, Gauss seidal and SLDR Techniques. **(10 Marks)**

b. Explain about stability properties of explicit Scheme on CFD. **(10 Marks)**

### Module-3

5 a. Explain briefly about surface grid generation and its applications. **(10 Marks)**

b. Compare and differentiate between structured and unstructured grid generation. **(10 Marks)**

**OR**

6 a. Write about structured grids and explain the different methods for structured grid generation. **(10 Marks)**

b. Explain about adaptive grids and write any two types of grid adaptive methods in detail. **(10 Marks)**

### Module-4

7 a. Differentiate between explicit and Implicit approach of finite difference equations. **(10 Marks)**

b. Explain Time Marching and Space Marching Techniques. **(10 Marks)**

**OR**

8 a. Explain about following :
   i) Lax-Wendroff method
   ii) Error and stability analysis. **(08 Marks)**

   b. With neat sketch, explain the general transformation of equation from a physical plane to a computational plane. **(12 Marks)**

## Module-5

9 a. Describe following with necessary equation and sketch :
   i) Special discretization
   ii) Temporal discretization. **(10 Marks)**

   b. Explain about Finite volume technique with neat diagram. **(10 Marks)**

**OR**

10 a. Explain the following :
   i) Upwind biasing
   ii) Flux Vector Splitting. **(10 Marks)**

   b. Construct a Finite volume discretization scheme on one dimensional steady heat conduction equation. $K\left(\frac{\partial^2 T}{\partial x^2}\right)+S=0$, where 'K' is the thermal conductivity of material, T is the temperature and S is the source head. **(10 Marks)**

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