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M.Tech. (ME) (Sem.–2)

COMPUTATIONAL FLUID DYNAMICS

Subject Code : MTME-204

M.Code : 74980

Date of Examination : 20-12-22

Time : 3 Hrs. Max. Marks : 100

INSTRUCTIONS TO CANDIDATES :

1. Attempt any FIVE questions in all.
2. Each question carries TWENTY marks.

1. a) What is CFD? Explain CFD methodology by giving steps in a CFD simulation?

   b) Explain the impact of CFD in today's engineering activity by giving minimum four practical examples.

2. Consider first order wave equation :

$$\frac{u}{t} C\frac{u}{x} = 0$$

   Present above equation in discretized form and obtain condition for stability of its numerical solution.

3. a) Identify and classify the following PDE's into elliptic, parabolic, hyperbolic equations. Give one practical example of each type.

   i) $\frac{T}{t} \quad \frac{^2T}{x^2}$ ii) $\frac{^2\rfloor}{x^2} + \frac{^2\rfloor}{y^2} \quad 0$ iii) $\frac{u}{t} + c\frac{T}{x} = 0$

   b) List any two types of errors encountered in numerical methods. Indicate how the errors occur.

4. Develop the solution algorithm for one dimensional transient heat conduction problem based on:

   a) Implicit scheme, b) Explicit scheme.

5. a) Write down step by step procedure for SIMPLER algorithm.

   b) Discuss stream function vorticity formulation. What is its advantage?

6. a) Develop solution methodology for 2D, unsteady convection-diffusion equation giving practical example.

   b) Explain Dirichlet, Neumann and Mixed type boundary conditions.

7. a) Discuss vortex panel method with example.

   b) Discuss cell centred formulation in finite volume technique.

8. Enlist the different turbulent modeling schemes. Discuss RANS model in details.

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.