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12MTP322

Third Semester M.Tech. Degree Examination, Dec. 2013/Jan. 2014
Computational Methods in Heat Transfer and Fluid Flow

Time: 3 hrs.

Max. Marks:100

Note: Answer any FIVE full questions.

- 1
 - a. What are the classification of physical behaviour of partial differential equations? Explain with example of each type. (10 Marks)
 - b. Determine the transient temperature distribution in a 1 – D solid with a thermal diffusivity α if the initial temperature in the solid is 0° and if at all subsequent times, the temperature of the left side is held at 0° while the right side is held at T_0 . (05 Marks)
 - c. Solve the second order wave equations $u_{tt} = c^2 u_{xx}$ on the interval $-\infty < x < \infty$ with initial data $u(x, 0) = f(x)$; $u_t(x, 0) = g(x)$. (05 Marks)
- 2
 - a. What are the different methods of deriving the discretization equations? Explain. (10 Marks)
 - b. Derive the two dimensional heat conduction in rectangular geometry by finite difference for steady state with no heat generation. (10 Marks)
- 3
 - a. Describe the solution of the linear algebraic equations. (10 Marks)
 - b. Discuss some geometric considerations of the discretization equations. (10 Marks)
- 4
 - a. Derive one dimensional unsteady heat conduction using finite volume method by the equation $SC \frac{\partial T}{\partial t} = \frac{\partial}{\partial x} \left(k \frac{\partial T}{\partial x} \right) + S$. (10 Marks)
 - b. Explain the solution procedures for unsteady flow calculations. (10 Marks)
- 5
 - a. Discuss consequences of the various schemes for steady one dimensional convection and diffusion. (10 Marks)
 - b. Explain the upwind scheme and the exact solution for one dimensional convection diffusion equation. (10 Marks)
- 6
 - a. Describe the pressure – correction equation in the calculation of the flow field. (10 Marks)
 - b. Describe the procedure for the calculation of the flow field using the simple algorithm. (10 Marks)
- 7
 - a. Develop the stream function – vorticity formulation for steady uniform axisymmetric flow over a solid sphere. (10 Marks)
 - b. What are the important ideas on which the MAC algorithm is based? Explain. (10 Marks)
- 8
 - a. Discuss unsteady transonic potential flow. (10 Marks)
 - b. Describe numerical methods of compressible flow equations. (10 Marks)

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Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
 2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.