Reg. No. : | | | | | | | | | | |

Question Paper Code: 49213

M.E. DEGREE EXAMINATION, DECEMBER 2014.

Elective

CAD / CAM

14PCD515 – COMPUTATIONAL FLUID DYNAMICS IN MANUFACTURING

(Regulation 2014)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions.

PART A - (5 x 1 = 5 Marks)

1. For higher order differential equation, which method is mostly preferred
   (a) Finite difference method (b) Central method
   (c) Forward method (d) Backward method

2. Fourier's law is related to
   (a) Conduction transfer (b) Convection transfer
   (c) Radiation transfer (d) Mass transfer

3. One dimensional fluid flow through a porous medium is governed by
   (a) Darcy's law (b) Newton's law (c) Euler's law (d) Bernoulli law

4. Newton's heat convection equation is
   (a)$q=h(T_s-T_f)$ (b)$q=2h(T_s-T_f)$ (c)$q=3h(T_s-T_f)$ (d)$q=4h(T_s-Tf)$

5. Cell Reynolds number govern by
   (a) Parabolic equations (b) Elliptical equation
   (c) Hyperbolic equation (d) Advection-diffusion equation

PART - B (5 x 3 = 15 Marks)

6. Define discretization and round off error.

7. Explain the strong and weak formulations of a boundary value problem.

8. State the importance of Patankar and spalding procedure.

9. Express the two dimensional unsteady heat convection and diffusion equation.

10. Differentiate one equation model and K models.

PART - C (5 x 16 = 80 Marks)

11. (a) How do you determine the accuracy of the discretization process? What are the uses and difficulties of approximating the derivatives with higher order finite difference schemes? How do you overcome these difficulties? (16)

Or

(b) Explain the grid generation technique based on PDE and summarize the advantages of the elliptic grid generation method. (16)

12. (a) (i) Find the numerical solution of one dimensional heat conduction through a pin fin. (8)

(ii) Discuss the alternating direction implicit method for solution of 1 - Dimensional Unsteady heat equation. (8)

Or

(b) Derive the two dimensional steady state conduction stiffness matrix. (16)

13. (a) Derive the energy equation for a viscous flow in partial differential non-conservation form. (16)

Or

(b) Derive the continuity equation for inviscid flow in partial differential non - conservation form. (16)

14. (a) Derive the stiffness matrix by FEM for one dimensional heat conduction, convection and heat generation. (16)

Or

(b) (i) Derive the one dimensional unsteady convection-diffusion equation. (16)

15. (a) Outline the MAC algorithm and show how the incompressible flow filed is obtained. (16)

Or

(b) Write the step by step procedure of SIMPLE algorithm. (16)

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