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

Question Paper Code: 51024

M.E. DEGREE EXAMINATION, DEC 2020

First Semester

CAD / CAM

15PMA124 - ADVANCED NUMERICAL METHODS

(Regulation 2015)

Duration: 1.15 hrs Maximum: 30 Marks

PART A - (6 x 1 = 6 Marks)

(Answer any six of the following questions)

1. Which of the following is the iterative method? CO1- R

   (a) Gauss elimination method (b) Crout's method

   (c) Gauss – Jacobi method (d) Gauss Jordon

2. The root of the equation $x^3 - 2x - 5 = 0$ lies between CO1- R

   (a) 0 and 1 (b) 1 and 2 (c) 2 and 3 (d) 3 and 4

3. The Error term in Adam – Bash forth Predictor formula is CO2 -R

   (a) $\frac{14\,h}{45}\Delta^4 y_0$ (b) $\frac{14\,h}{45}\Delta^4 y_0$ (c) $\frac{14\,h}{45}\Delta^4 y_0$ (d) None of the above

4. The Error of Runge kutta fourth order is CO2 -R

   (a) O (h^3) (b) O (h^2) (c) O (h^5) (d) O (h^4)

5. In solving equation $u_t = \alpha^2\, u_{xx}$ by crank- Nicholson method, to simplify method we take $\frac{(\Delta x)^2}{\alpha^2 k}$ as CO3- R

   (a) $\frac{1}{2}$ (b) 2 (c) 1 (d) 0

6. Hyperbolic equation is CO3- R

   (a) $4u_{xx} - 3u_{xy} + 2u_{yy} = 0$ (b) $4u_{xx} - 6u_{xy} + 2u_{yy} = 0$

7. Which of the following is the general form of Poisson's equation? CO4 -R

(a) $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = f(x, y)$ (b) $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$

(c) $\frac{\partial^2 u}{\partial x^2} = \frac{1}{\alpha^2} \frac{\partial u}{\partial t}$ (d) $\frac{\partial^2 u}{\partial x^2} = \frac{1}{\alpha^2} \frac{\partial^2 u}{\partial t^2}$

8. The Laplace equation i CO4 -R

(a) Hyperbolic (b) elliptic (c) parabolic (d) none of these

9. R(x) is orthogonal then CO5- R

(a) $\int_0^1 R(x)\, F_i(x)dx = 0$ (b) $\int_{-1}^1 R(x)\, F_i(x)dx = 0$ (c) $\int_0^1 R(x)\, dx = 0$ (d) $\int_0^1 F_i(x)dx = 0$

10 Which method is called "Weighted residual method"

(a) Least square method (b) Collocation method

(c) Galerkin method (d) Rayleigh-Ritz method

PART – B (3 x 8= 24 Marks)

(Answer any three of the following questions)

11. Use Faddeev's method to find the eigen values of the matrix CO1- App (8)
$A = \begin{pmatrix} 2 & -1 & 1 \\ -1 & 2 & 1 \\ 1 & -1 & 2 \end{pmatrix}$ and hence find its inverse.

12. Solve the boundary value problem xy'' + y = 0, y (1) = 1 and y (1.25) = 1.3513 by shooting method. Take h = 0.25 and assume the initial guesses for y' (1) as 1.2 and 1.5. CO2- App (8)

13. Solve $u_{tt} = u_{xx}$ up to t = 0.5 with a spacing of 0.1 subject to y (0, t) = 0, y(1, t) = 0, yt(x, 0) = 0 and y(x, 0) = 10 + x(1-x). CO3-App (8)

14. Solve the Poisson equation ∇^2 u = -10(x^2 + y^2 +10) subject to the condition u = 0 at x = 0 and x = 3, u = 3, u = 0 at y = 0 and u = 1 at y = 3 for $0 < x < 3$. Find the solution taking h = 1 with a square. CO4 -App (8)

15. Solve the boundary value problem CO5-App (8)

$u_{xx} + u_{yy} = -1,\ |x| \le 1,\ |y| \le 1$ and u=0 on $|x| = 1,\ |y| = 1$.

Use the Galerkin finite element method to determine the solution values at the nodes $(0,0), \left(\frac{1}{2}, 0\right)$ and $\left(\frac{1}{2}, \frac{1}{2}\right)$.

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