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**C Reg. No. :**

**Question Paper Code: 51P04**

M.E. DEGREE EXAMINATION, NOV 2017

First Semester

CAD / CAM

15PMA124 - ADVANCED NUMERICAL METHODS

(Regulation 2015)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

PART - A (5 x 1= 5 Marks)

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1. | Which of the following is the iterative method? | | | | | | CO1- R | | |
|  | (a)Gauss limination method | | | | (b) Crout’s method | | | | |
|  | (c) Gauss – Jacobi method | | | | (d) Gauss Jordon | | | | | |
| 2. | The Error term in Adam – Bash forth Predictor formula is | | | | | | CO2 -R | | |
|  | (a) | | (b) | | | (c) | (d) None | | |
| 3. | When explicit method is stable only if? | | | | | | CO3- R | | |
|  | (a) λ > 1 | | (b) λ > 1/2 | | | (c) λ < 1/2 | (d) λ < 1 | | |
| 4. | The PDE is elliptic when | | | | | | CO4 -R | | |
|  | (a) x > 0 and y < 0 | | (b) x < 0 and y < 0 | | | (c) x < 0 and y > 0 | (d) None | | |
| 5. | R(x) is orthogonal then | | | | | | CO5- R | | |
|  | (a) R(x) Fi(x)dx = 0 | | | (b) R(x) Fi(x)dx = 0 | | (c) R(x) dx = 0 | (d) Fi(x)dx = 0 | | |
|  | PART – B (5 x 3= 15Marks) | | | | | | | | |
| 6. | Write down formula for the Faddeev – Leverrier method? CO1-U | | | | | | | | |
| 7. | Write down Adam Bashforth’s predictor formulae. CO2-U | | | | | | | | |
| 8. | Give an example of parabolic equation. CO3-U | | | | | | | | |
| 9. | Write down the finite difference form of the equation CO4-U | | | | | | | | |
| 10. | Write formula for Galerkin Finite element method. CO5-U | | | | | | | | |
|  | PART – C (5 x 16= 80Marks) | | | | | | | | |
| 11. | (a) | (i) Evaluateto four decimal places by Newton’s – Raphson  method | | | | | | CO1- E | (8) |
|  |  | (ii) Solve by Gauss elimination method, the equations  2x + 3y – z = 5  4x + 4y -3z = 3  -2x + 3y – z = 1 | | | | | | CO1 -Ana | (8) |
|  |  | Or | | | | | |  |  |
|  | (b) | Using power method find the largest Eigen value and corresponding Eigen vector, find the matrix | | | | | | CO1- U | (16) |
|  |  |  | | | | | |  |  |
| 12. | (a) | Find y (0.2) by Runge kutta method of fourth order if  y” – x y’ = 0, y (0) =1, y’ (0) = 0 | | | | | | CO2- Ana | (16) |
|  |  | Or | | | | | |  |  |
|  | (b) | (i) Solve the equation y” (x) – xy (x) = 0 for y (xi), xi = 0, 1/3, 2/3,  given that y (0) + y’ (0) = 1 and y (1) = 1. | | | | | | CO2- Ana | (8) |
|  |  | (ii) Using Adam’s Bash forth method find y (4.4) given  5xy’ + y2 = 2,  y (4) = 1, y (4.1) = 1.0049,  y (4.2) = 1.0097 and y (4.3) = 1.0143. | | | | | | CO2- Ana | (8) |
|  |  |  | | | | | |  |  |
| 13. | (a) | (i) Discuss the stability of two dimensional heat equation  = α (+). | | | | | | CO3-App | (8) |
|  |  | (ii) Explain implicit method. | | | | | | CO3 -U | (8) |
|  |  | Or | | | | | |  |  |
|  | (b) | (i) Solve by Crank-Nicholson method ,  *0 < x < 1, t > 0 ; u(x, 0) = 0, u(0, t) = 0,*  *u(1,t) = 100t*. Compute u for one time with *h = 1/4*. | | | | | | CO3-App | (8) |
|  |  | (ii) Discuss ADI method to solve the two dimensional parabolic  equations. | | | | | | CO3-App | (8) |
|  |  |  | | | | | |  |  |
| 14. | (a) | Solve, , with and . Take h = 0.25 and apply Liebmann’s method to 3 decimal accuracy**.** | | | | | | CO4 - Ana | (16) |
|  |  | Or | | | | | |  |  |
|  | (b) | Obtain a finite difference scheme to solve the Laplace equation. Solve at the pivotal points in the square shown fitted with square mesh. Use Leibmamm’s iteration procedure.  (5 iteration only) | | | | | | CO4 - Ana | (16) |
| 15. | (a) | Solve the boundary value problem  , and u=0 on .  Use the Galerkin finite element method to determine the solution values at the nodes, and. | | | | | | CO4 - Ana | (16) |
|  |  | Or | | | | |  | |  |
|  | (b) | Solve the boundary value problem  , and u=0 on the boundary. Use the Galerkin finite element method to determine u at the nodes, and. | | | | | CO5-Ana | | (16) |
|  |  | | | | | | | | |