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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)

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| --- | --- | --- |
| 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) $\frac{14 h }{45}∆^{4}y\_{0}$  | (b)$ \frac{-19 h }{720}∆^{4}f$ | (c)$ \frac{-19 h }{720}∆^{4}f$ | (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 $xf\_{xx}+ y f\_{yy}=0 $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 $∇^{2}u=f\left(x,y\right)$ CO4-U |
| 10. | Write formula for Galerkin Finite element method. CO5-U |
|  | PART – C (5 x 16= 80Marks) |
| 11. | (a) | (i) Evaluate$\sqrt{12}$to four decimal places by Newton’s – Raphson  method  | CO1- E |  (8) |
|  |  | (ii) Solve by Gauss elimination method, the equations2x + 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 $\left(\begin{matrix}1&6&1\\1&2&0\\0&0&3\end{matrix}\right)$ | 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 $ u\_{t}$ = α ($u\_{xx}$+$ u\_{yy}$).  | CO3-App |  (8) |
|  |  | (ii) Explain implicit method. | CO3 -U |  (8) |
|  |  | Or |  |  |
|  | (b) | (i) Solve by Crank-Nicholson method , $ u\_{t}= \frac{1}{16}u\_{xx}$ *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$ u\_{xx} + u\_{yy}= 0$, , with $u(0,y) = 10 = u(1,y)$ and $u(x,0)=20= u(x,1)$. 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 $∇^{2}u=0$ 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 $ u\_{xx} + u\_{yy}= -1$, and u=0 on . Use the Galerkin finite element method to determine the solution values at the nodes, and.  | CO4 - Ana | (16) |
|  |  | Or |  |  |
|  | (b) | Solve the boundary value problem$ u\_{xx} + u\_{yy}= -2$, and u=0 on the boundary. Use the Galerkin finite element method to determine u at the nodes, and. |  CO5-Ana | (16) |
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