ANNA UNIVERSITY COIMBATORE

B.E. / B.TECH. DEGREE EXAMINATIONS : MAY / JUNE 2010

REGULATIONS : 2007

FOURTH SEMESTER

070030010 : NUMERICAL METHODS

(COMMON TO CIVIL / EEE / EIE / ICE / MECHATRONICS ENGG.)

TIME : 3 Hours **Max.Marks : 100**

PART – A

(20 x 2 = 40 MARKS)

ANSWER ALL QUESTIONS

1. What is meant by diagonally dominant?
2. State the condition for convergence of Gauss Seidal method.
3. By Gauss elimination method solve x + y = 2, 2x + 3y = 5.
4. Find the iterative formula $\sqrt[3]{N}$ by Newton Raphson method.
5. State any two properties of divided difference.
6. Obtain the interpolation quadratic polynomial for the given data by using Newton Forward Difference formula.

X	0	2	4	6
Y	-3	5	21	45

7. Find the parabola of the form $y = ax^2 + bx + c$ passing through the points (0,0) , (1,1) , (2,20).
8. State Interpolation and Extrapolation.
9. When Simpson's 1/3rd rule & 3/8th rule can be applied?
10. From the following table find the area bounded by the curve & the x-axis from x = 2 to x = 7.

X	2	3	4	5	6	7
F(x)	8	27	64	125	216	343

11. Write the formula used to find $\frac{dy}{dx}$ at $x = x_0$ using finite differences.
12. State Simpson's 3/8 rule of integration.
13. What are the limitations of Euler's method?
14. Given: $y' + y = e^x$, $y(0) = 0$, find $y(0.2)$ by Taylor's method.
15. What do you mean by single step and multi step methods? Give examples.
16. Write down Adam's predictor Corrector formula.
17. Classify $u_{xx} + 4u_{yy} + 3u_{xy} + 4u_y + 3u_x = 0$.
18. Write down Crank-Nicolson's Implicit formula.
19. What is Liebmann's principle?
20. Write different methods for solving boundary value problem.

PART – B

(5 x 12 = 60 MARKS)

ANSWER ANY FIVE QUESTIONS

21. a) Using Newton-Raphson iterative method, find the real root of $x \log_{10} x - 1.2 = 0$ correct to four decimal places. 6

    b) Find the negative root of the equation $x^3 - 2x + 5 = 0$. 6

22. a) Find the inverse of the following matrix $\begin{pmatrix} 4 & 1 & 2 \\ 2 & 3 & -1 \\ 1 & -2 & 2 \end{pmatrix}$ by using Gauss – Jordan method. 6

    b) Solve the system of equation 8x – y + z = 18, 2x + 5y – 2z = 3, x + y – 3z = -6 by Gauss Seidal method correct to three decimal places. 6

23. a) Using Newton's interpolation formula, find the melting point of the alloy containing 84% of lead & 42% of lead. 6

% of lead in the alloy (p)	40	50	60	70	80	90
Temperature in deg (c)	184	204	226	250	276	304

b) Construct the polynomial for the following data, 6

X	0	1	3	4
F(x)	-12	0	6	12

Hence evaluate f(2.5) & f(3.5)

24. a) Using cubic spline compute f(1.5) , f(1.75) & f'(1), 6

X	1	2	3
F(x)	-8	-1	18

b) Find the first three derivatives of the function below at the point x = 1.5 and x = 4.0 6

X	1.5	2.0	2.5	3.0	3.5	4.0
Y	3.37	7.0	13.625	24.0	38.875	59.0

25. a) Evaluate $\int_0^1 \frac{dx}{1+x^2}$ by two and three point Gaussian quadrature formula and hence find the value of π. 6

b) Evaluate $\int_4^{4.4}\int_2^{2.6} \frac{dydx}{xy}$ by using Trapezoidal rule. 6

26. a) Solve $y' - x^2y + 1 = 0$, $y(0) = 1$, find y(0.2) and y(0.4) by Taylor's series method. 6

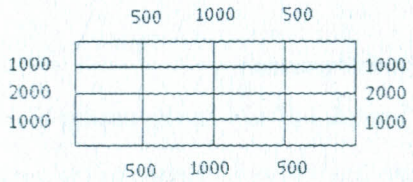
b) Compute y(0.2) and y(0.4) from $y' = \frac{y^2 - x^2}{y^2 + x^2}$, y(0) = 1 by Runge - Kutta method of fourth order taking h = 0.2. 6

27. a) Given $5xy' + y^2 = 2$, y(4) = 1, y(4.1) = 1.0049, y(4.2) = 1.0097, y(4.3) = 1.0143, compute y(4.4) using Milne's method. 6

b) Solve $xy'' + y = 0$, y(1) = 1, y(2) = 2 with h = 0.5 & h = 0.25 by finite difference method. 6

28. a) Using Crank – Nicolson scheme, solve $u_{xx} = 16u_t$, $0 < x < 1$, $t > 0$ given u(x , 0) = 0 = u(0 , t) and u(1 , t) = 100t, choose h = ¼. 6

b) Solve $\nabla_2 u = 0$ for the following mesh, with boundary values, by Leibmann's scheme. 6



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