Register Number: ………….…………

B.E. DEGREE EXAMINATIONS: NOV/DEC 2010

Fifth Semester

ELECTRONICS AND COMMUNICATION ENGINEERING

U07MA502: Numerical methods

Time: Three Hours   **Maximum Marks: 100**

Answer All the Questions:-

PART A (10 x 1 = 10 Marks)

1. The iterative formula for Newton- Raphson method is ------------

   A) $x_{i+1} = x_i - \frac{f(x_i)}{f'(x_i)}$ B) $x_i = x_{i-1} - \frac{f(x_i)}{f'(x_i)}$ C) $x_{i+1} = x_i + \frac{f(x_i)}{f'(x_i)}$ D) $x_{i+1} = x_i - \frac{f(x_i)}{f''(x_i)}$

2. The condition for the convergence of the iteration method to solve x = f(x) is ------------

   A) $f'(x) < 1$ B) $f(x) > 1$ C) $|f'(x)| < 1$ D) $|f'(x)| > 1$

3. The range of u for which Stirling's formula gives most accurate results is -------------

   A) $-\frac{1}{3} \le u \le \frac{1}{3}$ B) $-\frac{1}{4} \le u \le \frac{1}{4}$ C) $-\frac{1}{2} \le u \le \frac{1}{2}$ D) $-\frac{1}{5} \le u \le \frac{1}{5}$

4. If $f(x) = \frac{1}{x^2}$ then the divided difference of f (a, b) = --------------

   A) $-\frac{(a-b)}{a^2 b^2}$ B) $\frac{(a-b)}{a^2 b^2}$ C) $\frac{(a+b)}{a^2 b^2}$ D) $-\frac{(a+b)}{a^2 b^2}$

5. The error in Trapezoidal rule is -------------

   A) $-\frac{(b-a)}{12} h^2 y''(x)$ B) $\frac{(b-a)}{12} h^2 y''(x)$ C) $-\frac{(b-a)}{12} y''(x)$ D) $-\frac{(b-a)}{24} h^2 y''(x)$

6. To apply Simpson's $\frac{3}{8}$th rule the number of intervals should be multiples of ----------

   A) 2   B) 5   C) 7   D) 3

7. If y' (x) = x+y, y (0) =1, then the value of k_1 in R-K method of fourth order to find y (0.1) is _____

   A) 0.5   B) 0.1   C) 0.01   D) 10

8. The Euler's formula to solve y' = f(x, y) is ---------------

   A) $y_{n+1} = y_n + h f(x_n, y_n)$ B) $y_{n+1} = y_n - h f(x_n, y_n)$

   C) $y_n = y_{n-1} - h f(x_n, y_n)$ D) $y_{n+1} = y_n - f(x_n, y_n)$

9. The number of conditions required to solve the Laplace equation is ------------

   A) 2   B) 6   C) 4   D) 3

10. Bender – Schmidt recurrence scheme is useful to solve ------------- equation

   A) One dimensional wave equation   B) one dimensional heat equation

   C) Laplace equation   D) two dimensional heat equation

PART B (10 x 2 = 20 Marks)

11. Using Gauss elimination method solve $x + y = 2$, $2x + 3y = 5$.

12. Write the sufficient condition for Gauss –Seidel method to converge.

13. Obtain the divided difference table for the following data

x	2	5	10
y	5	29	109

14. Write down the Stirling's formula.

15. Write down the formula for $\frac{dy}{dx}$ at $x = x_0$ using forward difference operator.

16. State Simpson's 1/3 rd rule of numerical integration

17. Write down the Runge-Kutta formula of fourth order for solving $y' = f(x, y)$, $y(x_0) = y_0$

18. Write down the Milne's predictor and corrector formula.

19. Define the diagonal five point formula to solve the equation $u_{xx} + u_{yy} = 0$.

20. Name any two numerical methods that are used to solve one dimensional heat equation.

PART C (5 x 14 = 70 Marks)

21. a) (i) Find the real root of the equation $3x = Cosx + 1$ by Newton's method. (7)

   (ii) Solve by Gauss elimination method

   $2x + y + z = 10$, $3x + 2y + 3z = 18$, $x + 4y + 9z = 16$ (7)

(OR)

   b) Solve by Gauss Seidal method and by Gauss-Jacobi method

   $6x - 3y + z = 11$

   $2x + y - 8z = -15$

   $x - 7y + z = 10$

22. a) The following data are taken from the steam table .

Temperature °C:	140	150	160	170	180
Pressure kgf/cm²:	3.685	4.854	6.302	8.076	10.225

Find the pressure at temperature t= 142° and t= 175°

(OR)

b) (i)Using Lagrange's interpolation formula, find y (10) from the following table   (7)

X	5	6	9	11
y	12	13	14	16

(ii) Using Stirling's formula, find y (1.12) from the following table.   (7)

x	1.0	1.05	1.10	1.15	1.20	1.25	1.30
y	1.000	1.02470	1.04881	1.07238	1.09544	1.11803	1.14017

23. a) (i) Find y' at x= 1.5 from the data.   (7)

x	1.5	2.0	2.5	3.0	3.5	4.0
y	3.375	7.0	13.625	24.0	38.875	59.0

(ii) Dividing the range into 10 equal parts, find the approximate value of $\int_0^\pi sinx\ dx$ by

using trapezoidal rule.   (7)

(OR)

b) Evaluate $\int_2^{2.4}\int_4^{4.4} xy\ dx\ dy$ by using simpson's 1/3 rule by dividing the range into 4 equal

parts.

24. a) (i) Solve y' = x+ y ,y(0) =1 by Taylor's series method. Find the values of y at x= 0.1 and

x=0.2   (7)

(ii) 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.   (7)

(OR)

b) Given y" +xy' +y = 0, y (0) = 1, y'(0) =0 find the value of y (0.1) by R-K method of

fourth order.

25. a) Solve $u_{xx}=32u_t$ with h=0.25 for t>0; 0<x<1 and u(x,0)=u(0,t)=0; u(1,t)=t using Bender

Schmidt method.

(OR)

b) Solve the Poisson equation $\nabla^2 u = -10\ (x^2+y^2+10)$ over the square mesh with sides

x=y=0, x=y=3 with u=0 on the boundary and mesh length 1 unit.

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