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B.E. DEGREE EXAMINATIONS: NOVEMBER 2009

Fifth Semester

ELECTRONICS AND COMMUNICATION ENGINEERING

U07MA502: Numerical Methods

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

Answer ALL the Questions:-

PART A (10 × 1 = 10 Marks)

1. Iteration method is _____ method.

   A) Self starting B) not self starting

   C) Self correction D) not self correction.

2. Newton Raphson method is convergent _____.

   A) linearly B) quadratically C) cubically D) biquadratically.

3. The process of finding the value of a function outside the given range is called __.

   A) interpolation B) iteration C) Extrapolation D) approximation

4. The nth divided differences of a polynomial of the nth degree are_____.

   A) 0 B) 1 C) variable D) constant

5. Numerical differentiation can be used only when the difference of same order are _____.

   A) variable B) constant C) equal D) zero

6. Simpson's rule will give the same result as direct integration, if the entire curve is _____.

   A) parabola B) ellipse C) hyperbola D) straight line.

7. What is the order of error in Euler's method ?

   A) O(h) B) $O(h^2)$ C) $O(h^3)$ D) $O(h^4)$

8. Runge – Kutta method of second order is same as

   A) Taylor series method B) Euler's method

   C) Modified Euler's method D) Improved Euler's method

9. The condition for the equation $Au_{xx} + Bu_{xy} + Cu_{yy} + Du_x + Eu_y + Fu = G$ to be parabolic is

   A) $B^2 - 4AC < 1$ B) $B^2 - 4AC = 1$ C) $B^2 - 4AC > 0$ D) $B^2 - 4AC = 0$

10. The no.of conditions required to solve the Laplace equation is

A) 3 B)2 C)5 D)4

PART B (10 × 2 = 20 Marks)

11. What is the criterion for the convergence in Newton Raphson method?

12. State the principle used in Gauss Jordan method.

13. Find the divided difference table for the following data

x:	2	5	10
y:	5	29	109

14. State Newton's backward difference interpolation formula.

15. What is the order of error in Trapezoidal formula?

16. Why Simpson's one third rule is called a closed formula?

17. Is Euler's method a particular case of second order Runge – Kutta method?

18. What do we mean by saying that a method is self starting? Not self starting?

19. Classify the PDE $f_x - f_{yy} = 0$?

20. State the five point formula to solve the Poisson equation $u_{xx} + u_{yy} = 100$.

PART C (5 × 14 = 70 Marks)

21. a) i) Find a root of $x \log_{10} x - 1.2 = 0$ by Newton-Raphson method corr
three decimal places.

ii) Solve the given system of equations by using Gauss – Seidal iteration me

$20x + y - 2z = 17$

$3x + 20y - z = -18$

$2x - 3y + 20z = 25$

(OR)

b) i) Find the positive root of $x^3 - 2x - 5 = 0$ by Regula Falsi method.

ii) Solve the given system of equations by Gauss Jordan method

$x + 3y + 3z = 16$

$x + 4y + 3z = 18$

$x + 3y + 4z = 19$

i) Using Newton's formula, find the polynomial f(x) satisfying the following data. Hence evaluate y at x = 5.

x:	4	6	8	10
y:	1	3	8	10

ii) For the given values evaluate f(9) using Lagrange's formula.

x:	5	7	11	13	17
f(x):	150	392	1452	2366	5202

(OR)

b) i) From the data given below .find the no of students whose weight is between 60 to 70.

Weight is lbs :	0 – 40	40 – 60	60 – 80	80 –100	100-120
No of students:	250	120	100	70	50

(ii) Find f(x) as a polynomial in x for the following data by Newton's divided difference formula.

x :	– 4	– 1	0	2	5
f(x):	1245	33	5	9	1335

23. a) i) The following data gives the velocity of a particle for 20 seconds at an interval of 5 seconds .Find the initial acceleration using the entire data.

Time (sec) :	0	5	10	15	20
Velocity(m/sec):	0	3	14	69	228

ii) Evaluate $\int_0^1\int_1^2 \frac{2xy}{(1+x^2)(1+y^2)}dxdy$ by Trapezoidal rule with h = k = 0.25

(OR)

23 b) i) Given the following data ,find y'(6) & y'(5) and the maximum value of y.

x :	0	2	3	4	7	9
y :	4	26	58	112	466	922

ii) Using Simpson's one third rule evaluate $\int_0^1 xe^x dx$ taking 4 intervals.

24. a) i) By Taylor's series method find y(0.1) given that $y'' = y + xy'$, $y(0) = 1$ and $y'(0) = 0$.

ii) Using Milne's method find y (4.4) given $5x\,y' + y^2 - 2 = 0$ given y(4) = 1, y(4.1)= 1.0049, y(4.2)=1.0097 and y(4.3)=1.0143.

(OR)

b) Apply fourth order R-K Method to determine y (0.2) with h = 0.1 from $y' = x^2 + y^2$ given y (0) = 1.

25. a) Solve by Crank-Nicholson method the equation $u_{xx} = u_t$ subject to u(x,0) = 0, u(0,t) = 0 and u(1,t) = t , for two time steps.

(OR)

b) Solve $y_{tt} = y_{xx}$ upto t = 0.5 with a spacing of 0.1 subject to y(0,t) = 0, y(1,t) = 0, $y_t(x,0) = 0$, and y(x,0) = 10 + x(1-x).

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