Register Number: ……..

B.E DEGREE EXAMINATIONS: APRIL/MAY 2014

(Regulation 2009)

Sixth Semester

COMPUTER SCIENCE AND ENGINEERING

MAT108**:** Numerical Methods

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

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

1. The method " Method of tangents " is another name for

   a) Gauss – Elimination Method b) Newton's Method

   c) Gauss Jordan Method d) Gauss – Seidel Method

2. The convergence for Iteration method is said to be linear if the order of convergence p is

   a) 1 b) 2

   c) 0 d) 3

3. $\Delta \log(x) =$

   a) $\log\left(\frac{x+1}{x}\right)$ b) $x\log(x+1)$

   c) $(x+1)\log x$ d) $\log[x(x+1)]$

4. The polynomial which takes the values

x	0	1	2
y	1	2	1

   a) $y(x) = 1 + 2x + x^2$ b) $y(x) = 1 - 2x - x^2$

   c) $y(x) = 1 + 2x - x^2$ d) $y(x) = 1 - 2x + x^2$

5. What is the order of error in Simpson's formula?

   a) 5 b) 4

   c) 1 d) 2

6. In Simpson's three-eighth rule, the number of intervals is

   a) odd b) even

   c) multiple of 3 d) minimum of 7 ordinates

7. Given $\frac{dy}{dx} = x + y$, $y(0) = 1$, the value of y(0.1) by Taylor's method is

   a) 1.1103 b) 3.2101

   c) 2.212 d) 5.06

8. To use Milne's method, how many values of y we need prior to the required value of y?

   a) 5 b) 4

   c) 3 d) 2

9. In solving the equation $u_{tt} = a^2 u_{xx}$ by Crank-Nicholson method, to simplify method we take $\frac{(\Delta x)^2}{k a^2}$ as

   a) $\frac{1}{2}$ b) 2

   c) 1 d) 0

10. The partial differential equation $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = f(x,y)$ is called

    a) Heat equation b) Wave equation

    c) Laplace equation d) Poisson's equation

PART B (10 x 2 = 20 Marks)

11. State a sufficient condition for Gauss-Jacobi method to converge.
12. Establish an iteration formula to find the reciprocal of a positive number N by Newton-Raphson method.
13. Define: Forward and Backward difference operators.
14. Form the divided difference table for the following data:

x	2	5	10
y	5	29	109

15. What are the errors in Simpson's rules of numerical integration?
16. State Newton's formula to find $f'(x)$ using forward differences.
17. What are the advantages of R-K method over Taylor's method?
18. Solve $\frac{dy}{dx} = 1 - y, y(0) = 0$ *for* $x = 0.1$ by Euler's method.
19. Classify the PDE $xu_{xx} + yu_{yy} = 0$, $x > 0, y > 0$.
20. Write the standard five point formula.

PART C (5 x 14 = 70 Marks)

21. a) (i) Find a positive root of $xe^x = 2$ by the method of False position. (7)

    (ii) Apply Gauss – Jordan method to find the solution of the following system: (7)

    $10x + y + z = 12,\ 2x + 10y + z = 13,\ x + y + 5z = 7.$

    (OR)

b) (i) Find a real root of the equation $\cos x = 3x - 1$ correct to 4 decimal places by Iteration method. (7)

(ii) Solve the system by Gauss – Elimination method: (7)

$2x + 3y - z = 5,\ 4x + 4y - 3z = 3,\ 2x - 3y + 2z = 2$.

22. a) (i) From the following data, find ϑ at $x = 43$ and $x = 84$. (7)

x	40	50	60	70	80	90
ϑ	184	204	226	250	276	304

Also express ϑ in terms of x.

(ii) From the following table find f(x) and f(6) using Newton's interpolation formula (7)

x	1	2	7	8
f(x)	1	5	5	4

(OR)

b) (i) From the following table, using Stirling's formula , estimate the value of $\tan 16°$ (7)

x(in degrees)	0	5	10	15	20	25	30
y=tanx	0	0.0875	0.1763	0.2679	0.3640	0.4663	0.5774

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

x	5	6	9	11
y	12	13	14	16

23. a) (i) The table given below reveals the velocity v of a body during the time 't' specified. Find its acceleration at t = 1.1 (7)

t	1.0	1.1	1.2	1.3	1.4
v	43.1	47.7	52.1	56.4	60.8

(ii) Evaluate $\int_0^1 \frac{dx}{1+x^2}$ using Trapezoidal rule with h = 0.2. Hence obtain an approximate value of π. (7)

(OR)

b) (i) Find the value of $f'(0.5)$ using Stirling's formula from the following data (7)

x	0.35	0.40	0.45	0.50	0.55	0.60	0.65
Y=f(x)	1.521	1.506	1.488	1.467	1.444	1.418	1.389

(ii) Evaluate $\int_0^{\frac{\pi}{2}} \int_0^{\frac{\pi}{2}} \sin(x+y)\,dx\,dy$ by Trapezoidal rule. (7)

24. a) Using R.K. method of fourth order, find y (0.8) correct to four decimal places if $y' = y - x^2$, y(0.6) = 1.7379.

(OR)

b) Find y(2) if y(x) is the solution of $\frac{dy}{dx} = \frac{x+y}{2}$ given y(0) = 2, y(0.5) = 2.636, y(1) = 3.595 and y(1.5) = 4.968 using Milne's method.

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(l,t) t for two time steps.

(OR)

b) Solve $\nabla^2 u = 8x^2y^2$ for square mesh given u = 0 on the 4 boundaries dividing the square into 16 sub-squares of length 1 unit.

****