Reg. No. : | | | | | | | | | | |

Question Paper Code: 44002

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2017

Fourth Semester

Civil Engineering

14UMA422 - NUMERICAL METHODS

(Common to EEE, EIE and ICE Branches)

(Regulation 2014)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

(Smith chart may be permitted)

PART A - (10 x 1 = 10 Marks)

1. The order of convergence of method of false position is

(a) 1.618 (b) 1.816 (c) 1.168 (d) 1.186

2. The condition for convergence of Iteration method is

(a) $|\emptyset'(x)| > 1$ (b) $|\emptyset'(x)| < 1$

(c) $|\emptyset'(x)| = 1$ (d) $|\emptyset'(x)| < 0$

3. If the eigen values of A are -3,1,2 then dominant eigen value is

(a) 3 (b) -3 (c) 2 (d) 1

4. In Gauss Seidel method, diagonally dominant condition of coefficient matrix is

(a) Necessary and sufficient (b) Necessary but not sufficient

(c) Sufficient but not necessary (d) Neither necessary nor sufficient

5. I If $= \frac{x-x_0}{h}$, then the error in Newton's forward interpolation formula is

(a) $\frac{u(u-1)\ldots(u-n)}{(n)!}\mathrm{h}^{n+1}f^{n+1}(c)$ (b) $\frac{u(u-1)\ldots(u-n)}{(n-1)!}\mathrm{h}^{n+1}f^{n+1}(c)$

(c) $\frac{u(u-1)\ldots(u-n)}{(n+1)!}\mathrm{h}^{n+1}f^{n+1}(c)$ (d) $\frac{u(u-1)\ldots(u-n)}{(n+1)!}\mathrm{h}^{n}f^{n}(c)$

6. Forward interpolation formula is used to interpolate value of y for

(a) $0 < p < 1$ (b) $-1 < p < 0$ (c) $0 < p < -\alpha$ (d) $-\alpha < p < 1$

7. The number of equal sub intervals required to apply both Simpson's 1/3 rule and Simpson's 3/8 rule to evaluate an integral is

(a) Any number (b) Any multiple of 2

(c) Any multiple of 6 (d) Any multiple of 3

8. If the n^{th} divided difference of a polynomial is constant then the polynomial is of degree

(a) 0 (b) n +1 (c) n -1 (d) n

9. The number of equations needed to solve two unknowns in a system of equations is

(a) 2 (b) 3 (c) 5 (d) 6

10. The method of group averages is based on the assumption that the sum of the residuals is

(a) 0 (b) 1 (c) 2 (d) 3

PART - B (5 x 2 = 10 Marks)

11. State fixed point theorem.

12. Find inverse of A = $\begin{pmatrix} 1 & 3 \\ 2 & 7 \end{pmatrix}$ by Gauss – Jordan method.

13. Define Lagrange's inverse interpolation formula.

14. State the formula for three Point Gaussian-quadrature.

15. State the principle of least squares.

PART - C (5 x 16 = 80 Marks)

16. (a) (i) Find an approximate root of $x\log_{10}x - 1.2 = 0$ by False position method. (8)

(ii) Find the positive root of $x = \cos x$ usings Newton's method. (8)

Or

(b) (i) Find an iterative formula to find the reciprocal of a given number N and hence find the value of $\frac{1}{19}$. (8)

(ii) Solve the equation $x^3 + x^2 - 1 = 0$ for the positive root (correct to 4 decimal places) by iteration method. (8)

17.(a) (i) Solve $10x - 5y - 2z = 3$; $4x - 10y + 3z = -3$; $x + 6y + 10z = -3$, by Gauss Jacobi method. (8)

(ii) Find the inverse of $A = \begin{pmatrix} 2 & 1 & 1 \\ 1 & -1 & 1 \\ 4 & 2 & -3 \end{pmatrix}$ by using Gauss Jordan method. (8)

Or

(b) Find by power method, the largest eigen value and the eigen vector of the matrix $\begin{bmatrix} 25 & 1 & 2 \\ 1 & 3 & 0 \\ 2 & 0 & -4 \end{bmatrix}$ (16)

18. (a) (i) From the following table, find the value of $\tan 45^0 15'$ (8)

x^0	45	46	47	48	49	50
$\tan x^0$	1.00000	1.03553	1.07237	1.11061	1.15037	1.19175

(ii) From the following table find $f(x)$ and hence $f(15)$ using Newton's interpolation formula: (8)

x	4	5	7	10	11	13
$f(x)$	48	100	294	900	1210	2028

Or

(b) (i) Using Lagrange's interpolation formula, find y (9.5) given (8)

x	7	8	9	10
y	3	1	1	9

(ii) From the following table find $f(x)$ and hence $f(6)$ using Newton's interpolation formula. (8)

x	1	2	7	8
y	1	5	5	4

19. (a) (i) Evaluate $\int_{-3}^{3} x^4 dx$ using (i) Trapezoidal rule and (ii) Simpson's 1/3 rule by dividing 6 equal subintervals. Verify your results by actual integration. (8)

(ii) Evaluate $\int_1^{1.4} \int_2^{2.4} \frac{dxdy}{xy}$ using Simpson's rule, taking h = k = 0.1. Verify your result by actual integration. (8)

Or

(b) Evaluate $\int_1^{1.4} \int_2^{2.4} \frac{dxdy}{xy}$ using Trapezoidal rule and Simpson's rule with $h = 0.1$ and $k = 0.1$. (16)

20. (a) (i) By the method of least squares find the best fitting straight line to the data given below. (8)

x	*5*	*10*	*15*	*20*	*25*
y	*15*	*19*	*23*	*26*	*30*

(ii) Fit a curve of the form $y = ab^x$ to the data. (8)

x	*1*	*2*	*3*	*4*	*5*	*6*
y	*151*	*100*	*61*	*50*	*20*	*8*

Or

(b) (i) Obtain a curve of the form $y = ax^b$ to the data by the method of group averages. (8)

x	10	20	30	40	50	60	70	80
y	1.06	1.33	1.52	1.68	1.81	1.91	2.01	2.11

(ii) By the method of least squares, fit a curve of the form $y = ab^x$ to the data given below: (8)

x	1	2	3	4	5	6
y	151	100	61	50	20	8