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

Question Paper Code: 44022

B.E. / B.Tech. DEGREE EXAMINATION, DEC 2020

Fourth Semester

Civil Engineering

14UMA422 - NUMERICAL METHODS

(Common to EEE, EIE and ICE Branches)

(Regulation 2014)

Duration: One hour Maximum: 30 Marks

PART A - (6 x 1 = 6 Marks)

(Answer any six of the following questions)

1. Suppose a root of $f(x) = 0$ lies between 'a' and 'b'. Then by the method of false position, its first approximation x_1 is

   (a) $\frac{af(b)-bf(a)}{f(a)-f(b)}$ (b) $\frac{af(a)-bf(b)}{f(a)-f(b)}$

   (c) $\frac{af(b)-bf(a)}{f(b)-f(a)}$ (d) $\frac{af(a)-bf(b)}{f(b)-f(a)}$

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

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

3. 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

4. Power method is not applicable to the matrix whose Eigen vectors are

   (a) Linearly independent (b) Linearly dependent
   (c) Distinct (d) Not all non-zero

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

   (a) $\frac{\mathrm{a+b}}{\mathrm{a^2}b^2}$ (b) $\frac{\mathrm{a-b}}{\mathrm{a^2}b^2}$ (c) $-\frac{\mathrm{a-b}}{\mathrm{a^2}b^2}$ (d) $-\frac{\mathrm{a+b}}{\mathrm{a^2}b^2}$

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

7. Condition for maxima point for the function is

(a) $y' = 0, y'' < 0$ (b) $y' = 0, y'' > 0$ (c) $y' < 0, y'' = 0$ (d) $y' > 0, y'' < 0$

8. Simpson's $3/8^{th}$ rule is used only when the number of sub-intervals is

(a) odd (b) multiple of 3

(c) for all natural numbers (d) even

9. 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

10. If $y = 2x + 5$ is the best fit for 8 pairs of values $(x, y)$by the method of least squares and $\sum Y = 120$,the $\sum X =$

(a) 35 (b) 40 (c) 45 (d) 30

PART – B (3 x 8= 24 Marks)

(Answer any three of the following questions)

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

12. Solve by Gauss-Seidal method:
$27x + 6y - z = 85, x + y + 54z = 110, 6x + 15y + 2z = 72.$ (8)

13. Apply Lagrange's interpolation formula to find *f(9)* using the following data: (8)

x	*5*	*7*	*11*	*13*	*17*
y	*150*	*392*	*1452*	*2366*	*5202*

14. Find $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ at *x* = 1.5 from the data. (8)

x	*1.5*	*2.0*	*2.5*	*3.0*	*3.5*	*4.0*
y	*3.375*	*7*	*13.625*	*24*	*38.875*	*59*

15. 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*