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Question Paper Code: 54002

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

Fourth Semester

Civil Engineering

15UMA422 - NUMERICAL METHODS

(Common to Electrical and Electronics Engineering,
Electronics and Instrumentation Engineering and Chemical Engineering)

(Regulation 2015)

Duration: One hour

Maximum: 30 Marks

PART A - (6 x 1 = 6 Marks)

(Answer any six of the following questions)

1. What is the order of convergence of iteration method?
(a) 4 (b) 3 (c) 2 (d) 1
2. To what form the coefficient matrix is transformed in Gauss elimination method?
(a) Diagonal (b) Idempotent (c) Singular (d) Symmetric
3. The n^{th} divided differences of a polynomial of the n^{th} degree are
(a) n (b) constant (c) $n + 1$ (d) $n^2 + 1$
4. Newton's forward interpolation formula used only for _____ intervals.
(a) finite (b) infinite (c) equal (d) unequal
5. What is the order of error in Trapezoidal formula?
(a) h^2 (b) h^3 (c) h^4 (d) h^5
6. Apply Gaussian two-point formula, the value of $\int_{-1}^1 \frac{dx}{1+x^2} =$
(a) 3.0 (b) 2.5 (c) 2.0 (d) 1.5

7. Find $y(0.1)$ if $y' = 1 + y$, $y(0) = 1$, by using Euler's method.
 (a) 0.9231 (b) 1.2013 (c) 1.3012 (d) 0.0001
8. The Predictor-Corrector methods are _____ starting methods.
 (a) independent (b) multi self (c) not self (d) self
9. The second order linear partial differential equation is elliptic if
 (a) $b^2 - 4ac < 0$ (b) $b^2 - 4ac = 0$ (c) $b^2 - 4ac > 0$ (d) $b^2 - 4ac \leq 0$
10. In solving equation $u_t = \alpha^2 u_{xx}$ by Crank-Nicholson method to simplify method we take $\frac{(\Delta x)^2}{\alpha^2 k}$ as
 (a) 0 (b) $\frac{1}{2}$ (c) 1 (d) 2

PART – B (3 x 8= 24 Marks)

(Answer any three of the following questions)

11. Find the numerically largest eigen value of $A = \begin{bmatrix} 25 & 1 & 2 \\ 1 & 3 & 0 \\ 2 & 0 & -4 \end{bmatrix}$ by power method. (8)
12. Find $y(40)$ from the following data using Lagrange's interpolation formula given that $y(2) = 18$, $y(5) = 180$, $y(7) = 448$, $y(10) = 1210$, $y(12) = 2028$. (8)
13. Evaluate $\int_0^{\pi} \sin x \, dx$ by Trapezoidal rule, Simpson's 1/3 rule with $n = 10$. (8)
14. Using R-K method of fourth order, solve $\frac{dy}{dx} = \frac{y^2 - x^2}{y^2 + x^2}$ with $y(0) = 1$ at $x = 0.2$ and $x = 0.4$. (8)
15. Solve $u_{xx} + u_{yy} = -10(x^2 + y^2 + 10)$ over the square with sides $x = 0$, $y = 0$, $x = 3$, $y = 3$ with $u = 0$ on the boundary, taking $h = 1$. (8)