17U227 (Pages: 3) Name:..……..……

Reg.No……..……

SECOND SEMESTER B.C.A. DEGREE EXAMINATION, APRIL 2018

(Supplementary/Improvement)

(CUCBCSS-UG)

CC15U BCA2 C04 - NUMERICAL METHODS IN C

(Complementary Course: Mathematics)

(2015, 2016 admissions)

Time: Three hours Maximum: 80 Marks

Part A

Answer ***all*** questions. Each question carries one mark

1. Define the relative error in computation.
2. If x_n is the n^{th} iterate, then the Newton-Raphson formula is ……
3. …… method is based on the repeated application of the intermediate value theorem.
4. Define the augmented matrix for the system of equation $AX = B$.
5. In triangularization method the coefficient matrix is decomposed into the product of which type of matrices.
6. Write the system equation $x_1 + x_2 + x_3 = 1, 4x_1 + 3x_2 - x_3 = 6, 3x_1 + 5x_2 + 3x_3 = 4$ in matrix form.
7. If $f(2) = 4, f(2.5) = 5.5$ find $f(2.2)$ using Lagrange's interpolation.
8. Show that $\mu\delta = \frac{1}{2}(\Delta + \nabla)$.
9. Write forward difference table for the following data:

x	10	20	30	40
y	1.1	2.0	4.4	7.9

10. Using Euler's method find $y(0.1)$ given that $\frac{dy}{dx} = \frac{y-2x}{y}$, $y(0) = 1$.

(10 x 1 = 10 Marks)

Part B

Answer ***all*** questions. Each question carries two marks

11. Find a real root of the equation $x^3 - 2x - 5 = 0$ by the method of false position in two stages.

12. Solve the equations $x + 4y - z = -5, x + y - 6z = -12, 3x - y - z = 4$ by Gauss elimination method.
13. If $f(0) = 0, f(1) = 1, f(2) = 20$ find $f(x)$ using Lagrange's interpolation formula.
14. Given that $e = 2.72, e^2 = 7.39, e^3 = 20.09, e^4 = 54.6$, then find $\int_0^4 e^x \, dx$ by Simpson's rule.
15. Write the fourth order Runge Kutta formula.

(5 x 2 = 10 Marks)

Part C

Answer any ***five*** questions. Each question carries four marks

16. Apply Cramer's rule to solve the equations

$$x_1 + 2x_2 - x_3 = 2, \; 3x_1 + 6x_2 + x_3 = 1, 3x_1 + 3x_2 + 2x_3 = 3.$$

17. Evaluate $\frac{1}{N}$ to 3 decimal places by Newton's iterative method. Hence find the value of $\frac{1}{19}$.
18. Using Newton's forward formula , find the value of $f(1.02)$ if

x	1.0	1.1	1.2	1.3	1.4
y	1.841	1.891	0.932	0.964	0.985

19. Given that $y_3 = 2, y_4 = -6, y_5 = 8, y_6 = 9 \; and \; y_7 = 17$. Calculate $\Delta^4 y_3$.
20. Evaluate $\int_0^1 \frac{dx}{1+x^2}$ using Romberg's method. Hence obtain an approximate value for π.
21. Given $\frac{dy}{dx} = x + y, \; y(1) = 0$ then find $y(1.1)$ using Taylor series method.
22. Find $y'(0)$ and $y''(0)$ from the following table :

x	0	1	2	3	4	5
y	4	8	15	7	6	2

23. Solve the equations $x + y + z = 9, 2x - 3y + 4z = 13, 3x + 4y + 5z = 40$ by Gauss Jordan method.

(5 x 4 = 20 Marks)

Part D

Answer **any five** questions. Each question carries eight marks

24. Write the algorithm of Bisection method and using it, find a positive root of

$x - cosx = 0$.

25. Using LU decomposition method ,solve the equations

$$x_1 + x_2 + x_3 = 1, 4x_1 + 3x_2 - x_3 = 6, 3x_1 + 5x_2 + 3x_3 = 4.$$

26. Find the inverse of $\begin{bmatrix} 1 & 1 & 1 \\ 4 & 3 & -1 \\ 3 & 5 & 3 \end{bmatrix}$ by Gauss Jordan method.
27. Evaluate $\int_0^1 \frac{dx}{1+x}$ by Gaussian Quadrature formula.
28. Using Modified Euler method find $y(0.2), y(0.4)$ given $\frac{dy}{dx} = y - x^2, \; y(0) = 1.$
29. Use 4^{th} order Runge-Kutta method to find y for $x = .2$ in steps of 0.1 given that $\frac{dy}{dx} = x + y^2,$ and $y(0) = 1.$
30. Show that (1) $\Delta = \frac{1}{2}\delta^2 + \delta\sqrt{\left(1 + \frac{1}{4}\delta^2\right)}$ (2) $\delta = \Delta(1 + \Delta)^{\frac{-1}{2}} = \nabla(1 - \nabla)^{\frac{-1}{2}}$.
31. Construct the Hermite interpolation polynomial that fits the data:

x	f(x)	$f'(x)$
0	4	-5
1	-6	-14
2	-22	-17

Also interpolate $f(x)$ at $x = .5$

(5 x 8 = 40 Marks)

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