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SECOND SEMESTER B.C.A. DEGREE EXAMINATION, MAY 2017

(CUCBCSS–UG)

Complementary Course

BCA 2C 04—NUMERICAL METHODS IN C

Time : Three Hours Maximum : 80 Marks

Part A

Answer **all ten** *questions.*

1. Write – 302.867 in the floating point form rounded to 4 significant digits.
2. Define absolute error.
3. Give an example of a transcendental equation.
4. Using bisection method find the second approximation of the root of $x^3 - 4x - 9 = 0$ which lies between 2 and 3 ?
5. Find the second approximation of a root of the equation $x^3 - 5x + 2 = 0$ using Newton–Raphson method.
6. Write the system of equations :

   $6x + 3y + 2z = 6, 6x + 4y + z = 0, 20x + 15y + 12z = 0$ in the matrix form.
7. Give an example of an upper triangular matrix.
8. Write the characteristic equation of the matrix $\begin{bmatrix} 1 & -1 \\ 0 & 2 \end{bmatrix}$.
9. Define central difference operator δ.
10. Write the Trapezoidal rule.

($10 \times 1 = 10$ marks)

Part B

Answer **all five** *questions.*

11. Find the relative error and percentage error of $x = 0.005998$ if it is rounded-off to 3 decimal digits.
12. Find a real root of $x^3 - 9x + 1 = 0$ by Regula-Falsi method.
13. Solve $x + 2y - z = -3, 3x + y + z = 4, x - y + 2z = 6$ using Cramer's rule.

Turn over

14. Prove that :

(a) $\mu = \frac{E^{1/2} + E^{-1/2}}{2}$.

(b) $\delta = E^{1/2} - E^{-1/2}$.

15. What is numerical differentiation ?

(5 × 2 = 10 marks)

Part C

Answer any **five** *questions.*

16. Using Newton-Raphson method find square root of 12 correct to 2 places of decimals.

17. Factorize $\begin{bmatrix} 2 & 3 \\ 1 & 2 \end{bmatrix}$ in the LU form where L is unit triangular matrix and U is an upper triangular matrix.

18. By Gauss elimination method solve :

$4x + 11y - z = 33,\ x + y + 4z = 12,\ 8x - 3y + 2z = 20.$

19. Estimate the sale for 1966 using the following table :

Year	:	1931	1941	1951	1961	1971	1981
Sale (in thousands)	:	12	15	20	27	39	52

20. Find the cubic polynomial which takes the following values using Lagrange's method :

x	:	0	1	2	3
$f(x)$	:	1	0	1	10

21. Prove the following :

(a) $\Delta + \nabla = \frac{\Delta}{\nabla} - \frac{\nabla}{\Delta}$.

(b) $\mu = \sqrt{1 + \frac{\delta^2}{4}}$.

22. Evaluate $\int_1^2 \frac{1}{x}\,dx$ using Simpson's rule by dividing [1, 2] into 4 equal parts.

23. Explain the Euler's method of solving $\frac{dy}{dx} = f(x, y)$ with $y(x_0) = y_0$.

(5 × 4 = 20 mar

Part D

Answer any **five** *questions.*

24. Determine a real root of the equation $x\,e^x = 3$ using method of false position correct to 3 decimal places.

25. Find the real root of the equation $x^4 - x - 10 = 0$ correct to 3 decimal places using Newton–Raphson method.

26. Apply Gauss Jordan method to solve the system of equations :

$x + y + z = 9, -5x + 2z = -5, 8x - 3y + 2z = 20.$

27. Solve the following system of equations by LU decomposition method :

$2x_1 + x_2 + x_3 = 2, x_1 + 3x_2 + 2x_3 = 2, 3x_1 + x_2 + 2x_3 = 2.$

28. Find $f'(1.5)$ from the following table :

x :	1.5	2.0	2.5	3.0	3.5	4.0
$f(x)$:	3.375	7.000	13.625	24	38.875	59

29. Apply Euler's method to solve the initial value problem $\frac{dy}{dx} = x + y, y(0) = 0$ from $x = 0$ to $x = 1$ taking $h = 0.2$.

30. Apply Runge-Kutta method to find $y\,(0.2)$ in two steps if $\frac{dy}{dx} = x + y^2, y(0) = 1$.

31. (a) Find the relative error in the calculation of $\frac{7.342}{0.241}$ if numbers are correct 3 decimal places.

(b) From the following table, find the area bounded by the curve and x-axis from $x = 7.47$ to $x = 7.52$:

x :	7.47	7.48	7.49	7.50	7.51	7.52
$f(x)$:	1.93	1.95	1.98	2.01	2.03	2.06

$(5 \times 8 = 40$ marks)

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