D 43236 (Pages : 3) Name.....

Reg. No.....

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

(CUCBCSS–UG)

Complementary Course

BCA 2C 04—NUMERICAL METHODS IN C

(2014—2016 Admissions)

Time : Three Hours Maximum : 80 Marks

Part A (Objective Type Questions)

Answer **all** *questions.*
Each question carries 1 *mark.*

1. An approximate value of $\sqrt{2} = 1.414214\ldots$ is given 1.414. Find the absolute error and relative error.
2. State Rounding-off rule.
3. Calculate the value of $\sqrt{102} - \sqrt{101}$ correct to four significant figures.
4. What is the order of convergence of Regula-Falsi method.
5. Write Newton-Raphson iterative formula for $\sqrt[k]{N}$.
6. Describe Gauss Elimination method briefly.
7. In numerical integration, what should be the number of intervals to apply Simpson's 1/3 rule and by Simpson's 3/8 rule.
8. Write Runge-Kutta formula of fourth order to solve $\frac{dy}{dx} = f(x,y)$ with $y(x_0) = y_0$.
9. What is the order of the error in Simpson's 1/3-rule.
10. Write the relation between forward differences and backward differences.

(10 × 1 = 10 marks)

Part B (Short Answer Type)

Answer **all** *questions.*
Each question carries 2 *marks.*

11. Three approximate values of number $\frac{1}{3}$ are given as 0.30, 0.33 and 0.34. Which of these three is the best approximation ?
12. Find an interval of unit length which contains the smallest positive root of the equation $x^3 - 3x - 1 = 0$.

Turn over

13. Using Crammer's rule, solve the system $10x + y + z = 12$, $x + 10y + z = 12$ and $x + y + 10z = 12$.

14. Prove that (i) $\nabla = I - E^{-1}$; (ii) $E = e^{hD}$ where E is the shift operator and D is the differential operator.

15. Evaluate the integral $\int_0^{\pi/2} \sin x dx$, using Simpson's (3/8)-rule.

(5 × 2 = 10 marks)

Part C (Short Essay Type)

Answer any **five** *questions.*
Each question carries 4 *marks.*

16. Find the number of trustworthy figures in $(367)^{1/5}$ where 367 is correct to three significant figures.

17. Find a positive root of the equation $e^{-x} = \sin x$ by Regula-Falsi method correct to three decimal places.

18. Solve the system of equations $2x - 6y + 8z = 24$; $5x + 4y - 3z = 2$; $3x + y + 2z = 16$ by Gauss elimination method.

19. Find the Lagrange's interpolation polynomial fitting the points $f(0) = 2, f(1) = 1, f(2) = 12$.

20. Locate and correct the error in the following table of values :

x :	2.5	3.0	3.5	4.0	4.5	5.0	5.5
y :	4.32	4.83	5.27	5.47	6.26	6.79	7.23

21. Prove the following :

(a) $\Delta\nabla = \nabla\Delta = \delta^2$.

(b) $\Delta\left(f_i^2\right) = (f_i + f_{i+1})\Delta f_i$.

22. Find $\frac{dy}{dx}$ at $x = 1$ from the following table :

x :	0.7	0.8	0.9	1.0	1.1	1.2	1.3
y :	0.644218	0.717356	0.783327	0.841471	0.891207	0.932039	0.963558

23. Given the differential equation $\frac{dy}{dx} = \frac{1}{x^2 + y^2}$ with $y(4) = 4$. Obtain $y(4.1)$ and $y(4.2)$ by Taylor's series method.

(5 × 4 = 20 marks)

Part D (Essay Questions)

Answer any **five** *questions.*
Each question carries 8 *marks.*

24. (a) Find the relative error in computation of $x + y$ for $x = 11.75$ and $y = 7.23$ having absolute errors $\Delta x = 0.002$ and $\Delta y = 0.005$.

(b) If $a = 5.43$ m and $b = 3.82$ m, where a and b denote the length and breadth of a rectangular plate, measured accurate up to 1 cm., find error in computing its area.

25. (a) Find a root of the equation $x^3 - 4x - 9 = 0$ correct to three decimal places using Bisection method.

    (b) Using Newton's method obtain a root of the equation $x^3 - 5x + 1 = 0$ correct to three decimal places starting with $x_0 = 0$.

26. Solve the system of equations $2x + y + z = 10$; $3x + 2y + 3z = 18$; $x + 4y + 9z = 16$ by Triangularization method.

27. Derive Newton's forward difference interpolation formula for equally spaced points.

28. For the following table of values, estimate $f(7.5)$, using Newton's backward difference interpolation formula :

x :	1	2	3	4	5	6	7	8
$f(x)$:	1	8	27	64	125	216	343	512

29. Given $f(1) = -3$, $f(3) = 9$, $f(4) = 30$, $f(6) = 132$, find $f(x)$.

30. Evaluate $\int_0^{10} \frac{dx}{1+x^2}$ using Simpson's $\frac{1}{3}$ rule taking $h = 1$.

31. Solve $\frac{dy}{dx} = 1 - y$, $y(0) = 0$ in the range $0 \le x \le 0.3$ by taking $h = 0.1$ by modified Euler's method.

(5 × 8 = 40 marks)