C 62634 (Pages : 4) Name.....

Reg. No.....

SECOND SEMESTER (CUCBCSS—UG) DEGREE EXAMINATION MAY 2019

B.C.A.

BCA 2C 04—NUMERICAL METHODS IN C.

(2014 Admissions)

Time : Three Hours Maximum : 80 Marks

Part A (Objective Type)

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

1. 0.00056 has ———— significant digits.
2. Relative error E_r = ————.
3. Absolute error because of rounding off is ————.
4. After n bisections, the length of the subinterval which contains x_n is ————.
5. Newton-Raphson method is convergent :

   (a) Linearly. (b) Quadratically.

   (c) Cubically. (d) Biquadratically.
6. What is the other name of Regula Falsi method ?
7. When Gauss elimination method is used to solve AX = B, A is transferred in a ———— matrix.
8. State true or false: In Gauss-Jordan method, finding the values of $x_1, x_2, ..., x_n$ by using the process of back substitution.
9. Define the backward difference operator.
10. The error in Simpson's one-third rule is of the order ————.

(10 × 1 = 10 marks)

Turn over

Part B (Short Answer Type)

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

11. Find the relative error of the number 8.6 if both of its digits are correct.

12. Show that Newton-Raphson formula to find $\sqrt{a}$ can be expressed in the form $x_{n+1} = \frac{1}{2}\left(x_n + \frac{a}{x_n}\right)$, $n = 0, 1, 2, 3, \ldots$.

13. Solve by Gauss-Jordan method : $2x + y = 3, 7x - 3y = 4$.

14. Find $\Delta\left(\tan^{-1} x\right)$.

15. Using Euler's method, solve $y' = x + y, y(0) = 1$ for $h = 0.5$.

(5 × 2 = 10 marks)

Part C (Short Essay Type)

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

16. Define error and write the main three error sources.

17. Find a positive root of $xe^x = 2$ by the method of false position correct to 2 decimal places.

18. Solve by Gauss Elimination method $2x + 3y - z = 5, 4x + 4y - 3z = 3, 2x - 3y + 2z = 2$.

19. Using Lagrange's formula of interpolation find y (9. 5), given :

x	:	7	8	9	10
y	:	3	1	1	9

20. Find $\Delta^3 f(x)$ if $f(x) = (3x + 1)(3x + 4)(3x + 7) \ldots (3x + 19)$.

21. **Prove that** $\Delta = \frac{1}{2}\ \delta^2 + \delta\sqrt{1 + \frac{\delta^2}{4}}$.

22. The table given the results of an observation : θ is the observed temperature in degrees centigrade of a vessel of cooling water; t is the time in minutes from the beginning of observation.

t :	1	3	5	7	9
θ :	85.3	74.5	67.0	60.5	54.3

Find the approximate rate of cooling at $t = 3$.

23. Evaluate $\int_0^1 \frac{dx}{1+x^2}$ using Trapezoidal rule with $h = 0.2$.

(5 × 4 = 20 marks)

Part D (Essay Type)

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

24. (a) Write down the rules to round-off numbers.

(b) Sum of the following numbers 0.1532, 15.45, 0.000354, 305.1, 8.12, 143.3, 0.0212, 0.643 and 0.1743 when in each of which all the given digits are correct.

25. (a) Solve the equation $x \tan x = -1$ by Regula Falsi method starting with $a = 0.25$ and $b = 3$ correct to 3 decimal places.

(b) Find the root of $4x - e^x = 0$ that lies between 2 and 3 using Newton's method.

26. Solve the system by Gauss-Jordan method :

$x + y + z + w = 2$, $2x - y + 2z - w = -5$,

$3x + 2y + 3z + 4w = 7$, $x - 2y - 3z + 2w = 5$.

27. (a) Find the forward difference of $\frac{1}{x(x+4)(x+8)}$.

(b) Find $\Delta^n(\cos(ax+b))$.

Turn over

28. The following data are taken from the steam table :

Temp.°C	:	140	150	160	170	180
Pressure *kgf*/cm^2.	:	3.685	4.854	6.302	8.076	10.225

Find the pressure at temperature $t = 175°$.

29. From the data given below, find the number of students whose weight is between 60 and 70 :

Weight in Ibs	:	0 - 40	40 - 60	60 - 80	80 - 100	100 - 120
Number of students	:	250	120	100	70	50

30. Using Romberg's method, evaluate $\int_0^1 \frac{dx}{1+x}$ correct to three decimal places. Hence evaluate $\log_e 2$.

31. Solve the equation $\frac{dy}{dx} = 1 - y$ given $y(0) = 0$ using Modified Euler's method and tabulate the solutions at $x = 0.1$, 0.2, and 0.3.

(5 × 8 = 40 marks)