C 82167 (Pages : 4) Name.....

Reg. No.....

SECOND SEMESTER B.C.A. DEGREE [SUPPLEMENTARY/IMPROVEMENT] EXAMINATION, APRIL/MAY 2015

(UG–CCSS)

Complementary Course

CA 2C 04—NUMERICAL METHODS IN C

Time : Three Hours **Maximum : 30 Weightage**

I. Answer all *twelve* questions :

1 Give an example of an algebraic equation.

2 In the bisection method to find the root between a and *b* how we can find the first approximation.

3 Give the Newton-Raphson iteration formula.

4 When we can say that ξ is a root of the equation $f(x) = 0$?

Fill in the blanks :

5 In Gauss elimination method the system of simultaneous equations is transferred to an equivalent _____ system.

(a) Lower triangular.

(b) Upper triangular.

(c) Diagonal.

6 The relation between the shift operator E and the backward difference operator V is given by ∇ _____

(a) $E^{1/2} - E^{-1/2}$. **(b)** $1 - E^{-1}$.

(c) $E - 1$. **(d)** $1 + E$.

7 Runge-Kutta method of second order is also known as _____

(a) Euler's method. **(b) Picard's method.**

(c) Modified Euler's method. **(d) Taylor Series method.**

8 In the method of false position to find the root of $f(x) = 0$ between a and *b*, the first approximation is given by _____

(a) $x_1 = \frac{a+b}{2}$ **(b)** $xi = \frac{af(b) + bf(a)}{f(b) - f(a)}$

(c) $xi = \frac{af(a) - bf(b)}{f(a) - f(b)}$ **(d)** $\frac{af(a) + bf(a)}{f(b) + f(a)}$

Turn over

9 Which interpolating polynomial assigned both the function values and its first derivative values at each point of interpolation :

(a) Hermite interpolation Polynomial.

(b) Lagrange's interpolation polynomial.

(c) Newton's interpolation formula.

(d) Gauss interpolation formula.

10 What is the base of the hexadecimal system ?

(a) 10. (b) 6.

(c) 8. (d) 16.

11 In numerical integration which rule has an error of order. h^2 :

(a) Trapezoidal rule.

(b) Simpson's $\frac{1}{3}$ rule.

(c) Simpson's three eight rule.

12 If $f(x) = \frac{1}{x}$, find the divided difference f [a, :

(a) $\frac{1}{ab}$ (b) $\frac{-1}{ab}$

(c) $\frac{a-b}{ab}$. (d) $\frac{ab}{a-b}$.

(12 x $\frac{1}{4}$ = 3 weightage)

II. Short answer type questions. Answer *all* questions :

13 Taking h to be the interval of differencing find Δe^x.

14 Find y (0.1) by Euler's method given that $\frac{dy}{dx} = 1 - y$, y (0) = 0.

15 Find the 1st approximation of the root lying between 0 and 1 of the equation $x^3 + 3x - 1 = 0$ by Newton-Raphson formula.

16 Solve the following equations by Gauss-Jordan method $x + y = 2$, $2x + 3y = 5$.

17 Show that $Y = 1 - \frac{2}{n}$ is a solution of the difference equation $(n + 1) y_{n+1} + n y_n = 2n - 3$.

18 Convert $(58)_{10}$ to the corresponding binary number.

19 Construct the forward difference table for the following data :—

x :	0	1	2	3	4
y:	8	11	9	15	6

20 State Trapezoidal rule to evaluate $\int_{x_0} f(x)dx$.

21 If $I_1 = 0.775$, $I_2 = 0.7828$. Find **I** using Romberg's method.

(9 x 1 = 9 weightage)

III. Short essay questions. Answer any *five* :

22 Perform 4 iterations of the Newton-Raphson method to obtain the approximate value of $(17)^{1/3}$ starting with the initial approximation $x_0 = 2$.

23 Apply Cramer's rule to solve the equations $3x + y + 2z = 3$, $2x - 3y - z = -3$, $x + 2y + z = 4$.

24 Solve the following system of equations using Gauss elimination method :

$x + y + z = 9$

$2x - 3y + 4z = 13$

$3x + 4y + 5z = 40$.

25 Obtain the least squares polynomial approximation of degree one for $f(x) = x^{1/2}$ on [0, 1].

26 Find the value of y from the following data at $x = 2.65$.

x :	−1	0	1	2	3
	−21	6	15	12	3

27 Evaluate $\int_{1}^{2} \frac{dx}{1+x}$ using Trapezoidal rule.

28 Using Euler's method solve $\frac{dy}{dx} = 1 + xy$ with y (0) = 2. Find y (0.1) and y (0.2).

• (5 x 2 = 10 weightage)

IV. Essay type questions. Answer any *two* :

29 Given $y' = x^2 - y$, y(0) =1. Find y (0.1) using Runge-Kutta fourth order.

30 Evaluate $\int_0^1 \frac{dx}{1+x}$ using

(i) Trapezoidal rule.

(ii) Simpson's $\frac{1}{3}$ rule.

(iii) Simpson's $\frac{3}{8}$ rule.

Find the error in each method by comparing with the actual integration upto 4 places of determination.

31 Find the Hermite's interpolation polynomial for the following data :—

x	0	1	2
$f(x)$:	1	0	9
$f'(x)$:	0	0	24

(2 x 4 = 8 weightage)