

# Faculty of Science / Engineering

## End Semester Examination May 2025

### CA3CO20 Mathematics -III

<b>Programme</b>	:	BCA / BCA-MCA (Integrated)	<b>Branch/Specialisation</b>	:	-
<b>Duration</b>	:	3 hours	<b>Maximum Marks</b>	:	60

**Note:** All questions are compulsory. Internal choices, if any, are indicated. Assume suitable data if necessary.  
Notations and symbols have their usual meaning.

**Section 1 (Answer all question(s))****Marks CO BL**

<b>Q1.</b> The order of convergence in Newton-Raphson method is-	<b>1    1    1</b>
--	--------------------

<b>Rubric</b>	<b>Marks</b>
2	1

- 2       1  
 3       4

<b>Q2.</b> In finding the root of an equation $f(x)=0$ , the following values were obtained, $f(1.8) = -1.3024$ , $f(2.0) = 4.0$ next approximation by regula falsi method is-	<b>1    2    2</b>
--	--------------------

<b>Rubric</b>	<b>Marks</b>
1.8491	1

- 1.8761       1.8553  
 1.8491       1.8752

<b>Q3.</b> Let $k$ be a constant then $E(k)$ , where $E$ is shifting operator-	<b>1    1    1</b>
<input type="radio"/> 0 <input checked="" type="radio"/> $k$ <input type="radio"/> $k+1$ <input type="radio"/> None of these	

<b>Q4.</b> The nth divided difference of a polynomial of degree n is a-	<b>1    1    1</b>
---	--------------------

<b>Rubric</b>	<b>Marks</b>
constant	1

- 0       Constant  
 Variable       None of these

<b>Q5.</b> The Trapezoidal rule integrates exactly polynomial of order-	<b>1    1    1</b>
---	--------------------

<b>Rubric</b>	<b>Marks</b>
1	1

- 1       2  
 3       4

**Q6.** As soon as a new value of a variable is found by iteration, it is used immediately in the following equations, this method is called- 1 1 1

<b>Rubric</b>	<b>Marks</b>
Gauss-Seidal method	1

- Gauss-Jordan method       Gauss-Seidal method  
 Jacobi's method       None of these

**Q7.** A real valued function defined on a discrete sample space is called- 1 1 1

<b>Rubric</b>	<b>Marks</b>
discrete random variable	1

- Discrete random variable       Continuous random variable  
 Probability density function       None of these

**Q8.** The probability of getting 4 heads in 6 tosses of a fair coin is- 1 2 2

<b>Rubric</b>	<b>Marks</b>
15/64	1

- 15/64       12/64  
 11/64       None of these

**Q9.** Which is correct for normal distribution? 1 1 2

<b>Rubric</b>	<b>Marks</b>
mean deviation = 4/5 standard deviation	1

- mean deviation= standard deviation       mean deviation= 4/5 standard deviation  
 mean deviation= 1/2 standard deviation       None of these

**Q10.** If  $f(x) = ce^{-cx}$ ,  $c > 0$  represent exponential distribution curve then variance of this distribution is- 1 1 1

<b>Rubric</b>	<b>Marks</b>
option 2 is correct	1

- $\frac{1}{c}$         $1/c^2$   
  $2/c^2$        None of these

### Section 2 (Answer all question(s))

Marks CO BL

**Q11.** Define relative and absolute error in approximation. 2 1 1

<b>Rubric</b>	<b>Marks</b>
Definition of relative error and absolute error	2

**Q12.** Find the real root of the equation correct to three decimal places using Newton-Raphson method ,  $f(x) = x^3 - 2x - 5 = 0$ . 3 3 3

<b>Rubric</b>	<b>Marks</b>
find initial value and two iterations	3

- Q13. (a)** Apply Gauss-Seidal iteration method to solve the following equations (three iteration only)  
 $20x + y - 2z = 17$ ,  $3x + 20y - z = -18$ ,  $2x - 3y + 20z = 25$

5 3 3

Rubric	Marks
compute three iteration and final answer	5

(OR)

- (b)** Solve the following equations by Gauss-elimination method:  
 $2x + 4y + z = 3$ ,  $3x + 2y - 2z = -2$ ,  $x - y + z = 6$

Rubric	Marks
reduce the equation to upper triangular and find x, y, and z values	5

### Section 3 (Answer all question(s))

Marks CO BL

- Q14.** Evaluate the following-

$$\Delta \frac{1}{1+x^2}$$

Rubric	Marks
use formula of operator	3

- Q15. (a)** Find the missing values in the following table by using difference operator-

7 4 5

x	45	50	55	60	65
y	3	-	2	-	-2.4

Rubric	Marks
take missing term, make difference table, use difference operator form an equation then find missing term	7

(OR)

- (b)** Evaluate  $f(8)$  using Lagrange's interpolation formula for the following table:

x	0	1	2	5
y	2	3	12	147

Rubric	Marks
using formula of lagranges interpolation find the value of $f(8)$ )	7

### Section 4 (Answer all question(s))

Marks CO BL

- Q16.** Evaluate by  $\int_0^4 e^x dx$  Simpson's rule using data  $e = 2.72$ ,  $e^2 = 7.39$ ,  $e^3 = 20.09$ ,  $e^4 = 54.60$  and compare with the actual value.

3 4 5

Rubric	Marks
write formula and calculate	3

**Q17. (a)** Using Euler's method solve the differential equation in six steps:

$$\frac{dy}{dx} = x + 2y, \quad y = 0 \text{ when } x = 0, \quad h = 0.2$$

Rubric	Marks
formula and iterations to obtain y	7

(OR)

**(b)** Apply Runge Kutta method of fourth order to solve:

$$5 \frac{dy}{dx} = x^2 + y^2, \quad y(0) = 1 \text{ and find } y \text{ in the interval } 0 \leq x \leq 0.2, \quad h = 0.1$$

Rubric	Marks
apply formula and use proper iteration to obtain y	7

### Section 5 (Answer all question(s))

Marks CO BL

**Q18.** Evaluate  $E(X)$  and  $E(X^2)$  and variance for the following data:

4 3 2

x	0	1	2	5
f	2	3	5	7

Rubric	Marks
calculate $E(X)$ and calculate $E(X^2)$	4

**Q19. (a)** Assuming half the population of a town consumes fairness cream and that 100 investigators each take 10 individuals to see whether they are consumers, how many investigators would you expect to report that three people or less were consumers?

6 4 3

Rubric	Marks
use binomial distribution find probability using $x=0,1,2,3$	6

(OR)

**(b)** Fit Poisson distribution to the following and calculate total probability of following data-

Deaths	Frequency
0	122
1	60
2	15
3	25
4	10

Rubric	Marks
using the formula for poisson distribution for expected frequency and fit the distribution	6

### Section 6 (Answer all question(s))

Marks CO BL

**Q20.** Evaluate mean, variance and standard deviation of exponential distribution

4 1 3

Rubric	Marks
Derivation for mean, variance and SD	4

- Q21. (a)** In a normal distribution 31% of the items are under 45 and 8% are above 64. Find the mean and standard deviation. Given that if  $f(t) = \frac{1}{\sqrt{2\pi}} \int_0^t e^{-x^2/2} dx$ ,  $f(0.5) = 0.19$ ,  $f(1.4) = 0.42$

<b>Rubric</b>	<b>Marks</b>
using given probability find area of distribution and find mean and standard deviation	6

**(OR)**

- (b)** Assume that you usually get two phone calls per hour. Calculate the probability that a phone call will come within the next hour. Data is exponentially distributed.

<b>Rubric</b>	<b>Marks</b>
find parameter lambda or theta and use probability formula for exponential distribution	6

\*\*\*\*\*