

SC-102-ENGINEERING MATHEMATICS

Course Title	Engineering Mathematics	Course Code	SC-102
Year	I year	Course Group	Foundation
Teaching Scheme in Periods (L : T : P)	4:1:0	Credits	03
Methodology	Lecture +Tutorial	Total Contact Periods	150
CIE	60 Marks	YEE	40 Marks

Prerequisites:

This course requires the basic knowledge of Algebra, Trigonometry and Co-ordinate Geometry at Secondary school level.

Course Outcomes (COs):

At the end of the course, the student will have the ability to:

CO1	Solve systems of linear equations arising in engineering problems using matrices and determinants.
CO2	Apply trigonometric ratios of compound, multiple and sub-multiple angles, transform sums and differences into products (and vice versa) and use algebra of complex numbers to solve engineering problems.
CO3	Apply the concepts of straight lines, circles and solve engineering and geometrical problems.
CO4	Evaluate limits and derivatives of functions relevant to engineering applications.
CO5	Evaluate integrals of continuous functions using appropriate methods of integration.
CO6	Apply definite integration techniques to evaluate integrals, mean and RMS values and perform numerical integration of functions arising in engineering problems.

Course Content:

Unit-I Matrices and Determinants:

Duration: 25 Periods (L: 20– T:5)

Definition of Matrix-order of a matrix-Type of matrices with examples - Algebra of matrices: sum, difference, scalar multiplication and product of matrices - Equality of two matrices- Properties of Algebra of Matrices – Transpose of a Matrix – Definitions of symmetric and skew symmetric matrices with examples - Determinant of a square Matrix of order 2×2 - Determinant of a square matrix of order 3×3 by using Laplace's expansion, Properties of Determinants, Problems on Properties of Determinants-Singular and non-singular matrices- Minor and cofactor of an element of a square matrix - Adjoint of a square matrix- Multiplicative inverse of a square matrix. Solutions of system of simultaneous three linear equations in three unknown variables by using Cramer's rule and Matrix Inversion Method.

Unit- II Trigonometry:

Duration: 25 Periods (L: 20– T:5)

Trigonometric Ratios of Compound angles (without proof) -Trigonometric Ratios of Multiple and Sub- multiple angles ($2A$, $3A$, $A/2$) -Transformation of products into sums or differences and vice versa- Related problems.

Complex Numbers: Definition of Complex Number - Algebra of complex numbers: sum, difference, product and quotient of complex numbers - Conjugate of a complex number - Modulus of a complex number- Related problems.

Unit–III Co-ordinate Geometry:

Duration :25 Periods (L: 20– T:5)

Straight lines: Slope of straight line - Various forms of straight line: Point-Slope form, Two- Point form, Intercept form, and General equation of a Straight line - Angle between two Straight lines - Conditions for Parallelism and Perpendicularity of the Straight lines – Equation of a straight line parallel and perpendicular to the given straight line and passing through a point – Perpendicular distance from a point to the line -Distance between two Parallel lines - Intersection of two non-parallel lines.

Circles: General equation of a circle and its characteristics. To find the equation of a circle, given:

- i. Centre and radius,
- ii. Co-ordinates of end points of a diameter.

Unit–IV Differential Calculus:

Duration: 25 Periods (L: 20– T:5)

Functions and Limits: Definition of a function - constants, variables, independent and dependent variables - Algebraic functions, Trigonometric functions, Inverse Trigonometric functions, Exponential functions and Logarithmic functions – composition of two functions - concept of limits - Standard Limits (without proof) - Evaluation of Limits of the form: $\lim_{x \rightarrow \infty} \frac{f(x)}{g(x)}$ using Algebraic techniques- Evaluation of limits of the form: $\lim_{x \rightarrow l} \frac{f(x)}{g(x)}$ using Direct Substitution, Factorization

Differentiation: Definition of Derivative of a function -Derivatives of Standard Algebraic, Logarithmic, Exponential, Trigonometric, Inverse Trigonometric functions - Algebra of derivative of functions: Derivatives of Sum, Difference, Scalar Multiplication, Product, Quotient of functions- Derivative of function of a function (Chain rule)- Logarithmic Differentiation and derivative of implicit functions, derivative of Infinite Series- Successive differentiation with emphasis on second order.

Unit-V Integral Calculus-I:

Duration: 25 Periods (L: 20– T:5)

Integration as an inverse process of Differentiation- Indefinite integral of standard functions- Properties of Indefinite Integral- Integration by Substitution - Integrals using Trigonometric identities of the form:

$\int \sin^2 x \, dx, \int \cos^2 x \, dx, \int \sin^3 x \, dx, \int \cos^3 x \, dx, \int \sin Ax \cos Bx \, dx, \int \cos Ax \cos Bx \, dx$ and $\int \sin Ax \sin Bx \, dx$, where A and B are constants-Integrals of $\tan x$, $\cot x$, $\sec x$ and $\operatorname{cosec} x$ -Integrals of the form $\int \sin^m x \cdot \cos^n x \, dx$, where m and n are positive integers - simple problems integrals of some particular functions (Nine standard integrals) of the type:

$$\int \frac{1}{a^2+x^2} dx, \int \frac{1}{a^2-x^2} dx, \int \frac{1}{x^2-a^2} dx, \int \frac{1}{\sqrt{a^2+x^2}} dx, \int \frac{1}{\sqrt{a^2-x^2}} dx, \int \frac{1}{\sqrt{x^2-a^2}} dx, \int \sqrt{a^2+x^2} dx,$$

$\int \sqrt{a^2-x^2} dx$ and $\int \sqrt{x^2-a^2} dx$ - Integration by parts - Bernoulli's rule for integration by parts.

Unit-VI Integral Calculus-II:

Duration: 25 Periods (L: 20– T:5)

Definite integral - Fundamental Theorem of Integral Calculus – simple problems on definite integrals - Mean Values and Root Mean Square (R.M.S) values of a function in a given interval. Numerical Integration: Trapezoidal rule and Simpson's 1/3-rule to evaluate an approximate value of a definite integral in a given interval.

INSTRUCTIONAL STRATEGY:

These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes

1. Explicit instruction will be provided in intervention classes or by using different differentiation strategies in the main classroom.
2. Lecturer method (L) does not mean only traditional lecture method, but different type of teaching method and media that are employed to develop the outcomes.
3. Observing the way their more proficient peers use prior knowledge to solve current challenges and persevere in problem solving will help struggling students to improve their approach to engaging with rich contextual problems.
4. Ten minutes a day in Class room, at the end of class, or as a station in a series of math activities will help students build speed and confidence.
5. Topics will be introduced in a multiple representation.
6. The teacher is able to show different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.
7. In a perfect world, teacher would always be able to demonstrate how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding. When a concept cannot be applied in that manner, we can still share how it might be applied within mathematics.

Suggested Reference Books:

Sl. No.	Author	Title of Books	Publication/Year
1	B.S. Grewal	Higher Engineering Mathematics	Khanna publishers.
2	Shanti Narayan and P. K. Mittal	Text Book of Matrices	S. Chand Publishers
3	S. L. Loney	Plane Trigonometry	Arahant publications
4	S. L. Loney	Elements co-ordinate Geometry	Arahant publications
5	Shanti Narayan and P.K. Mittal	Integral Calculus	S. Chand Publishers
6	Shanti Narayan and P.K. Mittal	Differential Calculus	S. Chand Publishers
7	Joel Hass	Thomas' Calculus	Pearson publisher
8	By senior faculty	NCERT Mathematics text books of Class XI and XII	NCERT

Suggested E-Learning references:

1. <https://www.khanacademy.org/>
2. <https://www.wolframalpha.com/>
3. <https://onlinecourses.nptel.ac.in/>
4. <http://tutorial.math.lamar.edu/>

Suggested Learning Outcomes:

At the end of the course, the student will have the ability to:

1.0 Solve systems of linear equations arising in engineering problems using matrices and determinants.

- 1.1 Define Matrix.
- 1.2 Classify the types of Matrices with examples.
- 1.3 Define Equality of two Matrices
- 1.4 Compute the sum of two Matrices.
- 1.5 Compute the difference of two Matrices.
- 1.6 Compute the scalar multiplication of a Matrix.
- 1.7 Compute the product of two Matrices.

- 1.8 State the properties of Algebra of Matrices such as Commutative, Associative, Identity and Distributive properties with examples and counter examples.
- 1.9 Define Transpose of a Matrix and write its properties.
- 1.10 Some simple problems on 1.9.
- 1.11 Define Symmetric and Skew-symmetric Matrices with examples.
- 1.12 Expand the Determinant of a square of order 2×2 .
- 1.13 Expand the Determinant of a square of order 3×3 using Laplace's expansion.
- 1.14 State the Properties of Determinants.
- 1.15 Apply the Properties of Determinants to solve the problems.
- 1.16 Distinguish Singular and Non-singular Matrices.
- 1.17 Define minor and co-factor of an element of square Matrices of orders 2×2 and 3×3 with examples.
- 1.18 Compute Adjoint of a square Matrices of orders 2×2 and 3×3 .
- 1.19 Compute multiplicative inverse of non-singular square matrices of orders 2×2 and 3×3 .
- 1.20 Solve the system of three linear equations in three unknown variables using Cramer's rule.
- 1.21 Solve the system of three linear equations in three unknown variables using Matrix Inversion Method.

2.0 Apply trigonometric ratios of compound, multiple and sub-multiple angles, transform sums and differences into products (and vice versa) and use algebra of complex numbers to solve engineering problems.

- 2.1 State the Trigonometric ratios of compound angles i.e. $\sin(A \pm B)$, $\cos(A \pm B)$, $\tan(A \pm B)$ and $\cot(A \pm B)$.
- 2.2 Derive the identities i.e., $\sin(A+B)$, $\sin(A-B) = \sin^2 A - \sin^2 B$, etc.
- 2.3 Calculate the values of $\sin 15^\circ$, $\cos 15^\circ$, $\tan 15^\circ$, $\sin 75^\circ$, $\cos 75^\circ$, $\tan 75^\circ$ etc.
- 2.4 Solve the problems using 2.2 and 2.3
- 2.5 State the formulae for Trigonometric ratios of multiple angles $2A$ and $3A$.
- 2.6 State the formulae for Trigonometric ratios of sub multiple angle $\frac{A}{2}$.
- 2.7 Derive useful identities i.e. $\sin^2 A = \left(\frac{1 - \cos 2A}{2}\right)$, $\cos^2 A = \left(\frac{1 + \cos 2A}{2}\right)$ etc.
- 2.8 Solve the problems using 2.5, 2.6 and 2.7.
- 2.9 State the formulae on transform sum or difference of two Trigonometric ratios into a product and vice versa.

2.10 Solve the problems using 2.9

2.11 Define complex number.

2.12 Compute addition, subtraction, multiplication and division of complex numbers.

2.13 Define modulus, and conjugate of a complex number and list their properties

2.14 Solve the simple problems using 2.13

3.0 Apply the concepts of straight lines, circles and conic sections to analyze and solve engineering and geometrical problems.

3.1 Define slope of a straight line.

3.2 Classify various forms of a straight line:

- i. Point-slope form,
- ii. Two-point form,
- iii. Intercept form, and
- iv. General equation of a straight line.

3.3 Solve the Problems on 3.2

3.4 Find the acute angle between two straight lines.

3.5 Explain the conditions for parallelism and perpendicularity of straight lines.

3.6 Find the equation of parallel line which is passing through the given point.

3.7 Find the equation of perpendicular line which is passing through the given point.

3.8 Calculate the perpendicular distance of a point from a line.

3.9 Evaluate the distance between two parallel lines.

3.10 Determine the point of intersection of two non-parallel lines.

3.11 Define circle.

3.12 Write the general equation of a circle with Centre and radius.

3.13 Find the equation of a circle having its Centre and radius.

3.14 Find the equation of a circle having two ends of a diameter.

3.15 Solve the related problems on 3.12, 3.13. and 3.14

4.0 Evaluate limits and derivatives of functions relevant to engineering applications.

4.1 Define function with example.

4.2. Explain constants, variables, independent and dependent variables.

4.3 Explain various types of functions:

- i. Algebraic functions,

- ii. Trigonometric functions,
- iii. Inverse Trigonometric function,
- iv. Exponential functions and
- v. Logarithmic functions

4.4 State the standard limits:

$$\lim_{x \rightarrow a} \frac{x^n - a^n}{x - a}, \lim_{x \rightarrow 0} \frac{\sin x}{x}, \lim_{x \rightarrow 0} \frac{\tan x}{x}, \lim_{x \rightarrow 0} \frac{a^x - 1}{x}, \lim_{x \rightarrow 0} \frac{e^x - 1}{x}, \lim_{x \rightarrow 0} (1 + x)^{\frac{1}{x}}, \lim_{x \rightarrow \infty} \left(1 + \frac{1}{x}\right)^x.$$

4.5 Evaluate the Limits of the form $\lim_{x \rightarrow \infty} \frac{f(x)}{g(x)}$ using Algebraic techniques.

4.6 Evaluate the limits of the form $\lim_{x \rightarrow l} \frac{f(x)}{g(x)}$ using

- (i) Direct substitution,
- (ii) Factorization

4.7 Define the concept of derivative of a function $y = f(x)$ as $\lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$ (First Principle of Derivatives) of a function.

4.8 Find the derivatives of simple elementary functions like k (constant), x^n , $\sqrt{x}$, $\sin x$, $\cos x$ using the first Principle of Derivatives.

4.9 List the formulae for derivatives of standard algebraic, logarithmic, exponential, trigonometric and inverse trigonometric functions.

4.10 Explain the concept of algebra of derivatives of functions, i.e. derivative of sum, difference, scalar multiplication, product and quotient of functions to solve problems.

4.11 Find the derivatives using the method of Differentiation of a function of a function (Chain rule).

4.12 Apply the Properties of Logarithms for differentiating functions of the form: $[f(x)]^{g(x)}$.

4.13 Explain the procedure for finding derivatives of Implicit functions with examples.

4.15 Find the derivatives of Infinite series of the form: (i) $\sqrt{f(x) + \sqrt{f(x) + \sqrt{f(x) \dots \infty}}}$ and

(ii) $f(x)^{f(x)^{f(x) \dots \infty}}$.

4.12 Explain successive differentiation with examples and solve engineering problems related to second order.

5.0 Evaluate integrals of continuous functions using appropriate methods of integration.

5.1 Explain the concept of Integration as an inverse process of Differentiation with standard notations.

5.2 Classify the Definite and Indefinite Integrals.

5.3 Formulate the standard Integrals using the definition of Integration.

5.4 State the properties of Indefinite Integrals.

(i.e., $\int (u \pm v) dx$, and $\int ku dx$, where u, v are functions in x and k is a scalar).

5.5 Use the Indefinite integrals of standard functions and properties solve engineering problems.

5.6 Evaluate Integrals involving simple functions of the following types by the method of Substitution:

i) $\int f(ax + b) dx$, where $f(x)$ is in standard form,

ii) $\int [f(x)]^n f'(x) dx$,

iii) $\int \frac{f'(x)}{\sqrt{f(x)}} dx$

iv) $\int \frac{f'(x)}{f(x)} dx$

5.7 Find the integrals of $\tan x$, $\cot x$, $\sec x$ and $\operatorname{cosec} x$.

5.8 Use some trigonometric identities to find the integrals of the type: $\int \sin^2 x dx$, $\int \cos^2 x dx$, $\int \sin^3 x dx$, $\int \cos^3 x dx$, $\int \sin Ax \cos Bx dx$, $\int \cos Ax \cos Bx dx$ and $\int \sin Ax \sin Bx dx$, where A and B are constants.

5.9 Evaluate the integrals of some particular functions (Nine standard integrals) of the type:

$\int \frac{1}{a^2+x^2} dx$, $\int \frac{1}{a^2-x^2} dx$, $\int \frac{1}{x^2-a^2} dx$, $\int \frac{1}{\sqrt{a^2+x^2}} dx$, $\int \frac{1}{\sqrt{a^2-x^2}} dx$, $\int \frac{1}{\sqrt{x^2-a^2}} dx$, $\int \sqrt{a^2+x^2} dx$, $\int \sqrt{a^2-x^2} dx$ and $\int \sqrt{x^2-a^2} dx$, where a is a constant.

5.10 Evaluate Indefinite Integrals using Integration by parts.

5.11 Apply the Bernoulli's rule for evaluating the Integrals of the form $\int u \cdot v dx$, where u and v are functions in x .

6.0 Apply definite integration techniques to evaluate integrals, mean and RMS values and perform numerical integration of functions arising in engineering problems.

- 6.1 State the Fundamental Theorem of Integral Calculus.
- 6.2 Calculate the Definite Integrals over an interval by using the Fundamental Theorem of Integral Calculus.
- 6.3 Explain the Mean Value, Mean Square Value and Root Mean Square (RMS) value of the function in any given interval.
- 6.4 Obtain the Mean Values of the various functions in any given interval.
- 6.5 Find the Mean Square Value of the various functions in any given interval.
- 6.6 Evaluate the Root Mean Square (RMS) values of the functions in any given interval.
- 6.7 Explain Trapezoidal rule.
- 6.8 Explain Simpson's $\frac{1}{3}$ rule.
- 6.9 Apply the Trapezoidal rule estimate the approximation of definite integrals.
- 6.10 Apply the Simpson's $\frac{1}{3}$ rule estimate the approximation of definite integrals
- 6.11 Solve the problems leading to engineering applications by using above methods.

Suggested Student Activities:

- 1. Student visits Library to refer Standard Books on Mathematics and collect related material.
- 2. Quiz
- 3. Group discussion
- 4. Group Tests
- 5. Formulae Tests
- 6. Surprise tests
- 7. Seminars
- 8. Home Assignments.
- 9. Mathematics- for preparing competitive exams and solve some arithmetical ability exam questions

CO / PO – MAPPING:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	Mapped POs
CO1	3	2					1	1, 2, 7
CO2	3	2					1	1, 2, 7
CO3	3	2					1	1, 2, 7
CO4	3	3	2		1		1	1, 2, 3, 5, 7
CO5	3	3	2		1		1	1, 2, 3, 5, 7
CO6	3	3	2		1		1	1, 2, 3, 5, 7

MID-I EXAMINATION					
S.No	Unit Name	R	U	A	Remarks
1	Unit-I	1, 2	5(a) 5(b)	7(a) 7(b)	
2	Unit-II	3, 4	6(a) 6(b)	8(a) 8(b)	
Total Questions		4	4	4	
MID-II EXAMINATION					
S.No	Unit Name	R	U	A	Remarks
1	Unit-III	1, 2	5(a) 5(b)	7(a) 7(b)	
2	Unit-IV	3, 4	6(a) 6(b)	8(a) 8(b)	
Total Questions		4	4	4	

YEAR END EXAMINATION

Unit No	Questions to be set for YEE				
	R			U	A
I	Q4	Q1		Q9(a)	Q13(a)
II					
III		Q2		Q10(a)	Q14(a)
IV					
V		Q3	Q5,Q6	Q9(b), Q11(a), Q11(b)	Q13(b), Q15(a), Q15(b)
VI			Q7,Q8	Q10(b), Q12(a), Q12(b)	Q14(b), Q16(a), Q16(b)
Total Questions	8			8	8

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TELANGANA
DIPLOMA EXAMINATIONS (C - 26)

SC-102

MID – I EXAM, MODEL PAPER
ENGINEERING MATHEMATICS

Duration: 1: 00 Hour

Max. Marks: 20

PART-A

Instructions: 1. Answer **ALL** questions. 04 × 01 = 04
2 Each question carries **ONE** mark.

1. Define unit matrix.
2. Define singular matrix with example.
3. Write the formulae for $\cos C + \cos D$.
4. Write the conjugate of $-7 + i\sqrt{3}$.

PART-B

Instructions: 1. Answer All questions. 02 × 03 = 06
2. Each question carries **THREE** marks.

5(a). If $A = \begin{pmatrix} 0 & -1 & 3 \\ 8 & 7 & 3 \end{pmatrix}$ and $B = \begin{pmatrix} 8 & 0 & 1 \\ 0 & 12 & 0 \end{pmatrix}$ then find $B - A$.

OR

5(b). Find the adjoint of the matrix $A = \begin{pmatrix} 3 & 2 \\ 1 & 3 \end{pmatrix}$.

6(a). Prove that $\cos A + \cos(120^\circ + A) + \cos(120^\circ - A) = 0$.

OR

6(b). Find the value of $\cos 15^\circ$.

PART C

Instructions: 1. Answer All questions 02 × 05 = 10
2. Each question carries **FIVE** marks

7(a). Find the inverse of the matrix $A = \begin{pmatrix} 1 & 2 & 1 \\ 3 & 2 & 2 \\ 1 & 1 & 2 \end{pmatrix}$.

OR

7(b). Solve the system of equations $x + 2y - 3z = 0$, $4x - 5y + 6z = 5$, $-7x + 8y + 9 = 10$ using Cramer's rule.

8(a). Prove that $\cos 6A = 32\cos^6 A - 48\cos^4 A + 18\cos^2 A - 1$.

OR

8(b). If $\sin x + \sin y = \frac{4}{5}$ and $\sin x - \sin y = \frac{2}{7}$, then prove that $5\tan \frac{x+y}{2} + 14\tan \frac{x-y}{2} = 0$.

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TELANGANA
DIPLOMA EXAMINATIONS (C - 26)
SC-102
MID – II EXAM, MODEL PAPER
ENGINEERING MATHEMATICS

Duration: 1: 00 Hour

Max. Marks: 20

PART-A

Instructions: 1. Answer **ALL** questions. 04 × 01 = 04
2 Each question carries **ONE** mark.

1. Write the slope of the straight line $ax + by + c = 0$.
2. Write the equation of Circle whose center (h,k) and radius is r
3. Write the differentiation of $3\sin x - 7\cos x$ Circle + $4x^2$.

PART-B

Instructions: 1. Answer All questions. 02 × 03 = 06
2. Each question carries **THREE** marks.

5(a). Convert $7x + 11y + 81 = 0$ into intercept form.

OR

5(b). Find the point circle whose diameter 6

6(a). Calculate $\lim_{x \rightarrow 0} \frac{\sin ax - \sin bx}{\sin cx}$.

OR

6(b). Find the differentiation of $\frac{2x+4}{7x+1}$.

PART C

Instructions: 1. Answer All questions. 02 × 05 = 10
2. Each question carries **FIVE** marks.

7(a). Find the distance of the point (2, 3) from the line $x - y + 3 = 0$.

OR

7(b). find the equation to the circle whose end points of a diameter is (1,-3) and (2,4)

8(a). Fin the derivative of $\log[\sin(\cos(e^x))]$ with respect to x .

OR

8(b). If $y = x^3 + 6x^2 + 11x + 6$ then find $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$.

**STATE BOARD OF TECHNICAL EDUCATION & TRAINING,
TELANGANA DIPLOMA EXAMINATIONS (C - 26)**

SC-102

**YEAR END EXAM, MODEL PAPER
ENGINEERING MATHEMATICS**

Duration: 2:00 Hours

Max. Marks:

40

PART-A

Instructions: 1. Answer **ALL** questions.
08

08 × 01 =

2. Each question carries **ONE** mark.

1. Write any four types of matrices.
2. Write the general form of straight line.
3. Write the Bernoulli's formula for integration.
4. Find the length of a diameter of circle whose end point of diameter is (2,4) and (4,5).
5. Find the value of $\int e^{-2x} dx$.
6. Find the value of $\int (x - 3\tan x + 5) dx$
7. Define fundamental theorem of integral calculus.
8. Find the value of $\int_0^1 \frac{1}{1+x^2} dx$.

PART-B

Instructions: 1. Answer All question.

04 × 03 = 12

2. Each question carries **THREE** marks.

- 9(a). Find A, B if $A+B=\begin{pmatrix} 3 & 5 \\ 5 & 8 \end{pmatrix}$ and $A-B=\begin{pmatrix} -3 & -5 \\ 5 & 2 \end{pmatrix}$.

OR

- 9(b). Find $\int \sin 5x \cdot \cos 3x \, dx$.

- 10(a). Find the center and radius of the circle $x^2 + y^2 - 4x - 6y + 11 = 0$

OR

- 10(b). Find the mean value of xe^x between $x = 0$ and $x = 1$.

- 11(a). Evaluate $\int \frac{(\sin^{-1}x)^4}{\sqrt{1-x^2}} dx$.

OR

- 11(b). Evaluate $\int \frac{\cot x}{\log(\sin x)} dx$

- 12(a). Find R.M.S of $\sqrt{x}$ over the range $x = 1$ to $x = 3$.

OR

- 12(b). Evaluate $\int_0^6 y dx$ using trapezoidal rule, given that

x	0	2	4	6
y	3	7	11	9

PART C

Instructions: 1. Answer All questions

04 × 05 = 20

2. Each question carries **FIVE** marks

13(a). Solve the system of equations $x + y - 3z = -0, x - y + 6z = 6, -x + 2y + 9 = 10$ using Cramer's rule.

OR

13(b). Find $\int \sin^5 x \cdot \cos x^3 x \, dx$.

14(a). Find the derivative of $\frac{a-b\cos x}{a+b\cos x}$ with respect to x .

OR

14(b). Find the R.M.S value of $\sqrt{\log x}$ between $x = 1$ and $x = e$.

15(a). Evaluate $\int x^3 \cos 5x \, dx$.

OR

15(b). Evaluate $\int x \cdot \sin^{-1} x \, dx$.

16(a). Evaluate $\int_0^6 \frac{1}{1+x^2} dx$ using trapezoidal rule by taking $n = 6$.

OR

16(b). Evaluate $\int_1^{11} x^3 dx$ using Simpson's rule by taking $n = 10$.

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