(2025 Batch Onwards)

25ENUBC100 **Reg. No.** | | | | | | | | |

St Aloysius (Deemed to be University)
Mangaluru
SCHOOL OF ENGINEERING
(UG Programme)
BTech (AIML/ECE) - Semester I Degree Examination
December - 2025
LINEAR ALGEBRA AND CALCULUS

Time: 2 ½ Hours **Max Marks: 60**

PART – A

I. Answer any FIVE of the following questions: **(5x2=10)**

1. Evaluate a and b if $A = \begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & -2 \\ a & 2 & b \end{bmatrix}$ and $AA^T = 9I_3$.
2. Evaluate the sum and product of the eigen values of the matrix $\begin{bmatrix} 3 & 1 & 4 \\ 0 & 2 & 6 \\ 0 & 0 & 5 \end{bmatrix}$.
3. Investigate the convergence or divergence of the exponential sequence $(a_n) = 2^n$.
4. Discuss the convergence of the sequence $(a_n) = \frac{n^2+n}{2n^2+n}$.
5. Verify Rolle's theorem for $f(x) = x^2 - 4x + 3$ on $[1,3]$.
6. Solve for the first and second derivatives of $z = xe^y$.
7. Illustrate the volume of the solid bounded by $x = 0, y = 0, z = 0$, and $x + y + z = a$.
8. Illustrate the reduction formula for Gamma functions.

PART – B

II. Answer any FIVE full questions from the following: **(5x10=50)**

9. a. Explain about the consistency of a system of linear equations with an example. Discuss how rank of the augmented matrix determines whether a system is consistent or not. **(5)**

   b. Investigate the values of λ and μ such that the equations
   $$2x + 3y + 5z = 9$$
   $$7x + 3y - 2z = 8$$
   $$2x + 3y + \lambda z = \mu$$
   have (i) no solution and (ii) infinitely many solutions. **(5)**

10. Investigate the eigen values and eigen vectors of $A = \begin{bmatrix} 1 & 1 & 3 \\ 1 & 5 & 1 \\ 3 & 1 & 1 \end{bmatrix}$. **(10)**

11. a. Illustrate that the series $1 + r + r^2 + \cdots$
   (i) converges if $|r| < 1$,
   (ii) diverges if $r \geq 1$, and
   (iii) oscillates if $r \leq -1$. **(5)**

   b. Test for convergence:
   $$\frac{1}{4.7.10} + \frac{4}{7.10.13} + \frac{9}{10.13.16} + \cdots$$ **(5)**

Contd...2

25ENUBC100

12. a. Apply an appropriate convergence test to determine the nature of $\sum \frac{n!}{(n^n)^2}$. **(5)**

b. Using a suitable test, determine whether the series $\left(\frac{2^2}{1^2}-\frac{2}{1}\right)^{-1}+\left(\frac{3^3}{2^3}-\frac{3}{2}\right)^{-2}+\left(\frac{4^4}{3^4}-\frac{4}{3}\right)^{-3}+\cdots$ converges or diverges. **(5)**

13. a. Examine about the radius of curvature of the cycloid $x = a(\theta + sin\theta), y = a(1 - cos\theta)$ at any given point. **(5)**

b. Examine about the extreme values of $f(x, y) = x^3 - 3xy + y^3$. **(5)**

14. a. A rectangular box open at the top is to have volume 32 $cubic\ ft.$ Calculate the dimensions of the box requiring the least material for its construction. **(5)**

b. Calculate the points at which $f(x, y) = xy - x^2 - y^2 - 2x - 2y + 4$ attain extreme values. **(5)**

15. a. Determine the area inside $r = a(1 + cos\theta)$ and outside the circle $r = a$. Visualize the region mentioned. **(5)**

b. Determine $\int_0^{\frac{\pi}{2}} \sin^p x \cos^q x\, dx$ using Euler's integral of first kind. **(5)**

16. a. Determine $\beta(m, n)$ in terms of Gamma functions. **(5)**

b. Evaluate the area between $y^2 = 4ax$ and $x^2 = 4ay$. Visualize the region mentioned. **(5)**

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Mapping of Questions with Bloom's Level and Course Outcomes (COs)

Part	A								B							
Q. No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
									a b		a b	a b	a b	a b	a b	a b
Blooms Level	3	3	4	3	3	3	3	2	4	4	4	3	3	4	4	3
Mapped CO(s)	1	1	2	2	3	3	4	4	1	1	2	2	3	3	4	4

(2025 Batch Onwards)

25ENUBC101 Reg. No. | | | | | | | | |

ST ALOYSIUS (DEEMED TO BE UNIVERSITY)

Mangaluru

SCHOOL OF ENGINEERING

(UG Programme)

BTech (AIML/ECE) - Semester I Degree Examination

December - 2025

ENGINEERING PHYSICS

Time: 2 ½ Hours **Max Marks: 60**

PART – A

I. Answer any FIVE of the following questions: **(5x2=10)**

1. Discuss how the de Broglie wavelength applies to microscopic objects and why it is negligible for macroscopic objects.
2. Describe the concept of probability density and normalization of a wave function with suitable mathematical expressions.
3. Represent the computational basis states $|0\rangle$ and $|1\rangle$ using column vectors and explain their significance in quantum computing.
4. Demonstrate how the normalization condition is applied to the qubit state $|\psi\rangle = a|0\rangle + b|1\rangle$ and justify why normalization is necessary.
5. Define the terms 'Metastable state' and 'Population inversion".
6. Four level Laser more efficient than a three-level laser Justify your answer.
7. Interpret the physical meaning of the dielectric constant (ε_r) and express it in terms of capacitance.
8. Describe electric polarization in dielectrics.

PART – B

II. Answer any FIVE from the following: **(5x10=50)**

9. a. Derive Schrodinger's time independent one-dimensional wave equation for a particle of mass m with energy E. **(10)**

10. a. Discuss phase velocity and group velocity and derive an expression for group velocity on the basis of superposition of two travelling waves. **(5)**

    b. An electron is bound in a one-dimensional potential well of width $4A^0$, but of infinite wall height. Find its first three energy values. **(5)**

11. a. Explain the concept of a qubit and its representation on the Bloch sphere. Show how pure states $|0\rangle$ and $|1\rangle$ are represented on the Bloch sphere with neat diagram. **(10)**

Contd...2

12. a. Explain the terms: (i) Conjugate of a matrix, (ii) Transpose of a matrix, (iii) Unitary matrix. Show that Pauli matrices are unitary. **(5)**

b. Define Inner product. Find the Inner product of $\begin{bmatrix} 3+i \\ -i \end{bmatrix}$ and $\begin{bmatrix} 3i \\ 4 \end{bmatrix}$ **(5)**

13. a. Using Snell's law and the condition for Total Internal Reflection (TIR), derive the expression for Numerical Aperture (NA) of an optical fiber in terms of refractive indices of core, cladding and air. **(10)**

14. a. Explain how Einstein's theory predicts existence of stimulated emission. **(5)**

b. The angle of acceptance of an optical fiber is 30° when kept in air. Find the angle of acceptance when it is in a medium of refractive index 1.33. **(5)**

15. a. State the assumptions of quantum free electron theory and derive the expression for electrical conductivity according to quantum free electron theory. **(10)**

16 a. Explain the four main types of electric polarization. **(5)**

b. A parallel-plate capacitor has plate area 200 cm^2 and separation 2 mm. When air filled, its capacitance is 44.3 pF. After inserting a dielectric slab, capacitance becomes 354.4 pF. Calculate the dielectric constant of the material. **(5)**

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Mapping of Questions with Bloom's Level and Course Outcomes (COs)

Part	**A**								**B**											
Q. No.	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**		**11**	**12**		**13**	**14**		**15**	**16**	
										a	**b**		**a**	**b**		**a**	**b**		**a**	**b**
Blooms Level	**3**	**3**	**3**	**2**	**3**	**2**	**2**	**3**	**2**	**3**		**2**	**3**		**2**	**3**		**2**	**3**	
Mapped CO(s)	**1**	**1**	**2**	**2**	**3**	**3**	**4**	**4**	**1**	**1**		**2**	**2**		**3**	**3**		**4**	**4**	

(2025 Batch Onwards)

25ENUEC107 Reg. No. | | | | | | | | | |

ST ALOYSIUS (DEEMED TO BE UNIVERSITY)

Mangaluru

SCHOOL OF ENGINEERING

(UG Programme)

B.Tech (AIML/ECE) - Semester I- Degree Examination

December - 2025

FUNDAMENTALS OF ELECTRONICS

Time: : 2 ½ Hours **Max Marks: 60**

PART – A

I. Answer any FIVE of the following questions: (5x2=10)

1. As the temperature of a semiconductor rises, its _____ decreases, while the number of _____ increases.
   a) resistance, charge carriers
   b) band gap, photons
   c) mobility, atoms
   d) conductivity, impurities
2. Introducing _____ into a semiconductor increases the number of holes, resulting in a _____ type material.
   a) acceptor impurities, p-
   b) donor impurities, p-
   c) acceptor impurities, n-
   d) donor impurities, intrinsic
3. In a pn junction, the typical silicon barrier potential of about 0.7 V is formed when _____ diffuse across the junction, creating a depletion region that extends further into the _____ doped side.
   a) Minority carriers, heavily
   b) Majority carriers, lightly
   c) Electrons, heavily
   d) Holes, lightly
4. A MOSFET turns ON when _____ exceeds the threshold voltage, enabling current to flow between _____.
   a) V_{GS}, Collector and Emitter
   b) V_{DS}, Source and Body
   c) V_{GS}, Drain and Source
   d) V_{DS}, Gate and Drain
5. In a BJT, the ratio of collector current to base current is termed _____, while the ratio of collector current to emitter current is known as _____.
   a) β, α
   b) α, β
   c) V_{BE}, V_{CE}
   d) I_C, I_B

Contd...2

6. For an ideal Op-Amp, the input impedance is _____, and the output impedance is _____.
   a) Very low, Very high
   b) Zero, Infinite
   c) Infinite, Zero
   d) High, High
7. A _____ converts a physical parameter into a corresponding electrical signal, while a _____ simply senses or detects a physical change.
   a) Sensor, Transducer
   b) Transducer, Sensor
   c) Actuator, Sensor
   d) Sensor, Actuator
8. Active transducers generate their output using _____, whereas passive transducers require _____ to produce a measurable signal.
   a) self-generated energy, an external power source
   b) mechanical movement, stored charge
   c) light intensity, thermal energy
   d) amplification, magnetic field

PART – B

II. Answer any <u>FIVE</u> from the following: (5x10=50)

9. Describe how energy bands are formed in solids. Using energy band diagrams, compare conductors, insulators, and semiconductors.
10. Explain the operation of a full-wave centre-tapped rectifier with the help of appropriate waveform. Additionally, discuss influence of heat and light on electrical conduction in conductors and semiconductors.
11. Describe the major current components in a BJT and derive the mathematical relationship between α and β.
12. List and explain the key differences between a BJT and a MOSFET.
13. Define an Operational Amplifier (Op-Amp). Explain its internal input and output configurations, describe the pin diagram of the IC 741. Also, state any five applications of Op-Amps.
14. Describe any 5 characteristics of an Opamp along with the ideal and typical values for IC 741.
15. Explain the working principles and applications of light-sensitive devices such as the LDR and photodiode.
16. Define sensors and transducers, highlight the differences between them, and classify various types of sensors with suitable examples.

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Mapping of Questions with Bloom's Level and Course Outcomes (COs)

Part	A								B							
Q. No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Blooms Level	1	1	1	2	2	3	4	4	2	2	2	3	2	3	2	3
Mapped CO(s)	3	3	2	2	2	2	2	2	1	1	2	2	2	3	4	4

(2025 Batch Onwards)

25ENUEC108 Reg. No. | | | | | | | | |

St Aloysius (Deemed to be University)

Mangaluru

SCHOOL OF ENGINEERING

(UG Programme)

BTech (AIML/ECE) - Semester I Degree Examination

December - 2025

PROBLEM SOLVING THROUGH C PROGRAMMING

Time: 2 ½ Hours **Max Marks: 60**

PART – A

I. Answer any FIVE of the following questions: **(5x2=10)**

1. Explain the purpose of an algorithm with one suitable example.
2. List the different input and output devices.
3. Apply recursion to write the steps for computing the factorial of a number.
4. Explain how elements are stored and accessed in a one-dimensional array with a suitable example.
5. Apply the conditional operator to find the largest of two numbers.
6. Differentiate between while and do-while loop.
7. Demonstrate how a file can be opened in read mode in C with proper syntax and explanation.
8. Analyze the working of array and structure with suitable examples.

PART – B

II. Answer any FIVE full Questions from the following: **(5x10=50)**

9. a. With a neat sketch, Explain the different components of a Computer System. **(5)**
   b. Define Variables? Explain the rules to declare variables in C. Mention any two valid and Invalid variable declaration. **(5)**

10. a. With examples, Explain the Primitive Data Types in C. **(5)**
    b. Implement a Simple Calculator using switch statement. **(5)**

11. a. Explain formatted input and output functions in C with examples. **(5)**
    b. Explain any four string manipulation functions in C. **(5)**

12. Analyze how branching and looping statements work together to control the flow of a C program. Compare their roles with suitable examples. **(10)**

13. With programming example, explain how parameters are passed to functions. **(10)**

Contd...2

14. a. Explain the declaration, initialization, and accessing of two-dimensional array. **(5)**

    b. Explain pointers. Write a program to swap two numbers using pointers. **(5)**

15. Examine the Binary Search process by analyzing all mid-element comparisons to locate the ***key = 42*** in the sorted list: **(10, 18, 25, 32, 42, 57, 63, 79, 90)** **(10)**

16. Implement a C program to enter student details (Name, register number, marks in 6 subjects) of N students display grade based on average. **(10)**

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Mapping of Questions with Bloom's Level and Course Outcomes (COs)

Part	A								B											
Q. No.	1	2	3	4	5	6	7	8	9		10		11		12	13	14		15	16
									a	b	a	b	a	b			a	b		
Blooms Level	2	3	3	2	3	2	2	4	2	2	2	3	2	2	3	4	2	3	3	3
Mapped CO(s)	1	1	3	3	2	2	4	3	1	1	1	2	2	3	2	1	3	4	2	4

(2025 Batch Onwards)

25ENUEC109 Reg. No. | | | | | | | | |

ST ALOYSIUS (DEEMED TO BE UNIVERSITY)

Mangaluru

SCHOOL OF ENGINEERING

(UG Programme)

End Semester Exam – December 2025

B.Tech (ECE/AIML) - Semester I

FUNDAMENTALS OF ARTIFICIAL INTELLIGENCE

Time: 2 hrs. **Max Marks: 50**

Note:

1. This question paper consists of 2 sections. PART- A and PART- B
2. Answer FOUR questions from PART - B

PART – A

I. Answer any FIVE of the following questions: **(5x2=10)**

1. Define Machine Learning.
2. Explain Exploratory Data Analysis?
3. Define Overfitting.
4. List the types of Machine Learning.
5. Describe Dimensionality Reduction?
6. Define Perceptron.
7. Enumerate the concept of Feature Engineering?

PART – B

II. Answer any FOUR from the following: **(4x10=40)**

8. a. Explain in detail about the impact of AI in healthcare with a real time example. **(5)**
   b. List out the differences between AI, ML and Deep Learning with examples **(5)**

9 a. Explain K-means algorithm with a suitable example. **(5)**
   b. Describe Linear Regression with an example. **(5)**

10. a. Elaborate any five Feature Engineering Techniques with examples. **(5)**
    b. Define & explain Supervised, Unsupervised and Reinforcement Learning. **(5)**

11. a. Explain Confusion Matrix with an example. Discuss TP, TN, FP, FN with an example. **(5)**
    b. Explain Accuracy, Precision, Recall and F1 Score. **(5)**

Contd...2

12. a. List out the differences between Classification and Regression **(5)**

b. Compare Clustering and Association **(5)**

13. a. Elaborate Perceptron algorithm with an example. **(5)**

b. Define Deep Learning and list its applications. **(5)**

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Mapping of Questions with Bloom's Level and Course Outcomes (COs)

PART	A							B															
Q. No.	1	2	3	4	5	6	7	8		9		10		11		12		13	
								a	b	a	b	a	b	a	b	a	b	a	b
Blooms Level	1	1	1	2	2	1	2	2	2	2	2	3	3	2	2	2	3	3	2
Mapped CO(s)	1	1	2	2	2	3	4	1	1	2	2	2	2	3	3	2	2	3	3

(2025 Batch Onwards)

25ENUHM114 Reg. No. | | | | | | | | |

ST ALOYSIUS (DEEMED TO BE UNIVERSITY)
Mangaluru
SCHOOL OF ENGINEERING
(UG Programme)
BTech (AIML/ECE) - Semester I - Degree Examination
December - 2025
UNIVERSAL HUMAN VALUES

Time: 2 hrs. **Max Marks: 50**

Note:
1. This question paper consists of 2 sections. PART- A and PART- B

PART – A

I. Answer any FIVE of the following questions: **(5x2=10)**

1. Prosperity is a need of
   i. Self
   ii. Body
   iii. Both self and Body
   iv. Money

2. Human beings aspire for continuous _____ and _____
   i. Happiness, Prosperity
   ii. Money, love
   iii. Respect, Glory
   iv. Success, Money

3. Harmony should be maintained in between _____ and _____
   i. Body, Life
   ii. Self, Body
   iii. Self, Society
   iv. All of the above

4. Needs of Body _____ and _____
   i. Water, food
   ii. Trust, respect
   iii. Trust, food
   iv. Peace, water

5. Give examples of co-existence existing in nature.

6. Which one explains about society
   i. People living together, in a relationship of mutual fulfilment
   ii. People living together, but not in relationship of mutual fulfilment
   iii. People living separately, in opposition/struggle
   iv. None of the above

7. Your way of defining non-violence is _____

PART – B

II. Answer any FOUR full questions from the following: **(4x10=40)**

8. a. Discribe the role of education (Sanskar) for human life. **(5)**
   b. Write a short note on self-exploration at four levels. **(5)**

Contd...2

9	a.	Enumerate the methods to take care and nurture your body.	(5)
	b.	Describe ways to nourish and uplift your soul.	(5)
10.	a.	Analyze 3 ways of evaluations which leads to disrespect.	(5)
	b.	Expand upon the dimensions of human order- Health-Self regulation.	(5)
11.	a.	Elaborate one of the dimensions of human order- Exchange-Storage.	(5)
	b.	Illustrate the dimensions of human order- Justice-Preservation.	(5)
12.	a.	Classify the units of nature into four orders with examples.	(5)
	b.	Differentiate between units and space in nature.	(5)
13.	a.	Give examples of harmony among the four orders of nature.	(5)
	b.	Interpret Policies (or Nithi) in the context of the characteristic of ethical human conduct in detail.	(5)

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Mapping of Questions with Bloom's Level and Course Outcomes (COs)

PART	A							B										
Q. No.	1	2	3	4	5	6	7	8		9		10		11		12		13	
								a	b	a	b	a	b	a	b	a	b	a	b
Blooms Level	2	2	2	2	2	2	2	2		2		3		2		2		3	
Mapped CO(s)	1	1	2	2	3	4	4	1		2		3		3		4		4	