(2025 Batch Onwards)

25ENUBC150 Reg. No. | | | | | | | | |

ST ALOYSIUS (DEEMED TO BE UNIVERSITY)

Mangaluru

SCHOOL OF ENGINEERING

(UG Programme)

BTech (CSE/ISE) - Semester I Degree Examination

December - 2025

DISCRETE MATHEMATICS AND LAPLACE TRANSFORMS

Time: 2 ½ Hours **Max Marks: 60**

PART – A

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

1. Explain negation operator and write its truth table.
2. Check the truth value of $\exists x\ P(x)$ where $P(x)$ is $x^2 + 2 = 0$, where the domain of discourse is the set of real numbers.
3. Explain isomorphism of two graphs.
4. Differentiate between Euler path and Euler circuit.
5. If $\mathbf{R} = x\vec{i} + y\vec{j} + z\vec{k}$, show that $\vec{\nabla}.\mathbf{R} = 3$.
6. Differentiate between solenoidal and irrotational vector.
7. Determine L $\{e^{at}\}$.
8. Explain first shifting property of Laplace transforms with an example.

PART – B

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

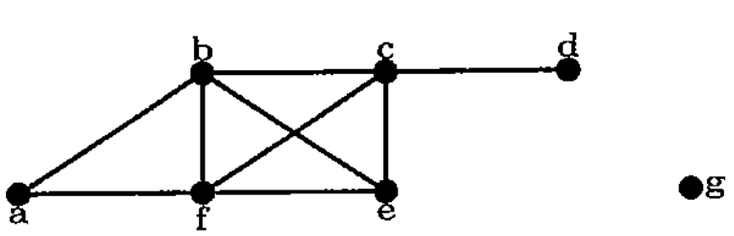
9. a. Show that $\neg p \rightarrow (q \rightarrow r)$ and $q \rightarrow (p \vee r)$ are logically equivalent **without using truth table.** **(5)**

   b. Show that $p \vee (q \wedge r)$ and $(p \vee q) \wedge (p \vee r)$ are logically equivalent using truth table. **(5)**

10. a. State and prove De Morgan's Law for quantifiers. **(5)**

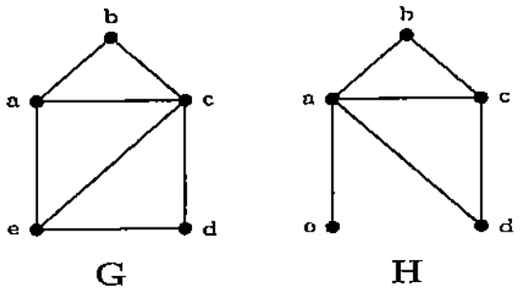
    b. Write the truth value of $\forall x\ (x^2 \geq x)$ if the domain consists of all real numbers. How does the truth value of this statement changes if the domain consists of all integers. **(5)**

11. a. Write the degrees and neighborhoods of the vertices in graph G. **(5)**

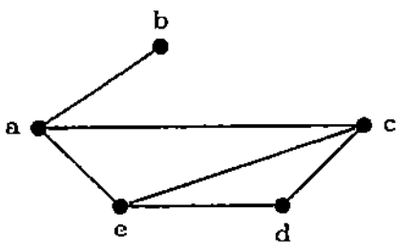


Contd....2

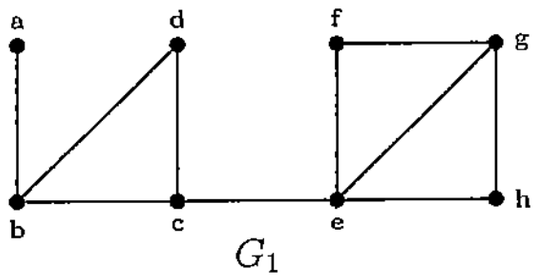
b. Determine whether the graphs are isomorphic. **(5)**



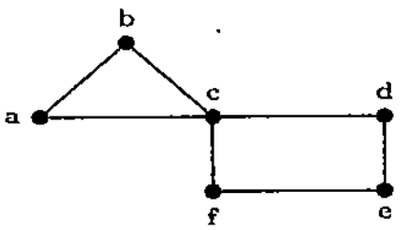
12. a. Use adjacency list to describe the simple graph given in the figure: **(5)**



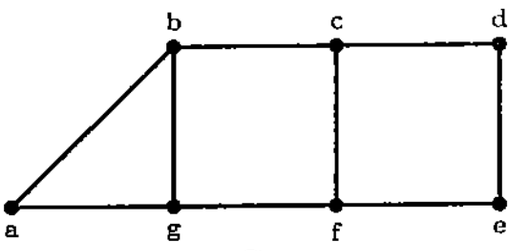
b. Find the edge connectivity for each of the following graphs: **(5)**



G_1



G_2



G_3

13. a. Prove that $\vec{\nabla} r^n = n r^{n-2}\,\mathbf{R}$, where $\mathbf{R} = x\,\vec{i} + y\,\vec{j} + z\,\vec{k}$, and $r^2 = x^2 + y^2 + z^2$. **(5)**

b. Find the angle between the surfaces $x^2 + y^2 + z^2 = 9$ and $z = x^2 + y^2 - 3$ at the point (2, -1, 2). **(5)**

Contd....3

25ENUBC150

14. a. Prove that div $(r^n \mathbf{R}) = (n+3)\, r^n$, where, **(5)**

$\mathbf{R} = x\vec{i} + y\vec{j} + z\vec{k}$, and $r^2 = x^2 + y^2 + z^2$.

Hence, show that $\frac{\mathbf{R}}{r^3}$ solenoidal.

b. If F = grad $(x^3 + y^3 + z^3 - 3\,x\,y\,z)$, find div F and curl F. **(5)**

15. a. Evaluate L {sin 2t sin 3t} and L $\{\cos^2 2t\}$. **(5)**

b. Calculate: **(5)**

i. $L\left\{\frac{1-e^t}{t}\right\}$

ii. $L\left\{\frac{\cos at - \cos bt}{t} + t\sin at\right\}$

16 a. Determine the L {sinh at} and L {cosh at}. **(5)**

b. Apply convolution theorem to evaluate $L^{-1}\left\{\frac{s^2}{(s^2+a^2)(s^2+b^2)}\right\}$. **(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	a	b
Blooms Level	2	2	2	2	2	2	2	2	3		3		3		3		3		3		3		3	
Mapped CO(s)	1	1	2	2	3	3	4	4	1		1		2		2		3		3		4		4	

(2025 Batch Onwards)

25ENUBC151 **Reg. No.** | | | | | | | | |

ST ALOYSIUS (DEEMED TO BE UNIVERSITY)

Mangaluru

SCHOOL OF ENGINEERING

(UG Programme)

BTech (CSE/ISE) - Semester I- Degree Examination

December - 2025

ENGINEERING CHEMISTRY

Time: : 2 ½ Hours **Max Marks: 60**

PART – A

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

1. Define ionization energy and state one factor influencing it.
2. Identify one reference electrode and state its application.
3. Differentiate between yellow rust and brown rust based on conditions of formation.
4. List two factors that increase corrosion rate.
5. State two properties that distinguish nanomaterials from bulk materials.
6. Classify any two types of solid waste based on their source.
7. Define degree of polymerization.
8. State the meaning of saponification value.

PART – B

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

9. a. Illustrate the working of a H_2-O_2 fuel cell using a labelled schematic. **(5)**

   b. Outline the procedure for potentiometric titration and apply the Nernst equation to determine the electrode potential of a single-ion redox system. **(5)**

10. a. Analyze the variation of Ionisation energy within a period and group using suitable examples. **(5)**

    b. Demonstrate how conductometric titration helps in identifying the end point of a strong acid–strong base titration. **(5)**

11. a. Compare galvanic corrosion and differential aeration corrosion using annotated diagrams. **(5)**

    b. Discuss the classification of inhibitors used in the reduction of corrosion rate. **(5)**

Contd...2

12. a. Discuss the mechanisms and effects of boiler corrosion and caustic embrittlement. **(5)**

b. Describe the effectiveness of anodic protection relative to cathodic protection. **(5)**

13. a. Summarize the sol–gel method for synthesizing metal-oxide nanoparticles. **(5)**

b. Interpret the environmental implications of improper solid-waste disposal. **(5)**

14. a. Explain the applications of nanomaterials in the electronics and health sectors. **(5)**

b. Propose sustainable waste-management strategies suitable for urban settings. **(5)**

15. a. Explain the mechanism of free radical polymerization. **(5)**

b. Compare addition and condensation polymers by highlighting differences in mechanism, by-products, and examples. **(5)**

16. a. Briefly outline the engineering and medical applications of polymers. **(5)**

b. Explain the underlying science and formulation engineering of how hair conditioners and skin moisturizers function. **(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	a b
Blooms Level	2	2	2	2	2	2	2	2	3 3	4 3	4 3	4 3	2 4	3 5	2 4	2 4
Mapped CO(s)	1	5	2	2	1	2	1	4	5 5	1 5	2 3	2 3	1 2	1 3	1 1	1 4

(2025 Batch Onwards)

25ENUEC157 Reg. No. | | | | | | | | |

ST ALOYSIUS (DEEMED TO BE UNIVERSITY)

Mangaluru

SCHOOL OF ENGINEERING

(UG Programme)

BTech (CSE/ISE) - Semester I Degree Examination

December - 2025

FUNDAMENTALS OF DIGITAL ELECTRONICS

Time: : 2 ½ Hours **Max Marks: 60**

PART – A

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

1. Convert $(1101011.111)_2$ into Decimal and hexadecimal number systems
2. Illustrate NOT gate using universal gates.
3. Define Demorgans Laws.
4. Explain Half Adder with truth table.
5. Design a 2:1 multiplexer using basic logic gates.
6. Explain the working of D Flip-Flop with truth table.
7. Design a 3-bit synchronous counter.
8. Compare Sequential and combinational circuits.

PART – B

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

9. Convert the following
   I. $(728.125)_{10}$= (?)$_2$ II. $(726.13)_8$= (?)$_{10}$ III. $(25A)_{16}$= (?)$_{10}$
   IV. $(1101011.101)_8$= (?)$_{16}$ V. $(110100111010.0101)_{16}$ = (?)$_8$ **(10)**
10. Simplify Boolean function $f_{(ABCD)} = \Sigma (3, 4, 5, 7, 9, 13, 14, 15)$ using Karnaugh map. **(10)**
11. Explain Full adder with neat sketch and truth table. **(10)**
12. Explain JK flip flop with neat sketch and truth table. **(10)**
13. Design 4 bit binary ripple counter. **(10)**
14. Design D and T flipflop using JK flip flop. **(10)**
15. Perform the subtraction using 1's and 2's Complement method $(39)_{10} - (48)_{10}$ **(10)**
16. Design a 1 bit comparator using logic gates. **(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
Blooms Level	2	1	1	2	2	1	2	2	3	3	1	1	3	3	3	3
Mapped CO(s)	1	1	1	2	2	3	4	3	1	2	2	3	4	3	1	2

(2025 Batch Onwards)

25ENUEC158 Reg. No. | | | | | | | | |

ST ALOYSIUS (DEEMED TO BE UNIVERSITY)

Mangaluru

SCHOOL OF ENGINEERING

(UG Programme)

B.Tech (CSE/ISE) - Semester I Degree Examination

December - 2025

PROBLEM SOLVING USING PYTHON

Time: : 2 ½ Hours **Max Marks: 60**

PART – A

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

1. Define identifiers in Python and state any two naming rules with examples.
2. Classify the main categories of literals supported in Python and state an example for each.
3. Illustrate how *break* and *continue* influence loop execution using a programming example.
4. Differentiate between actual arguments and formal arguments in function.
5. List any two operations that can be performed on strings with suitable examples.
6. Identify any two file access modes used in Python file handling.
7. Describe the use of bar charts and pie charts in representing data visually.
8. List any two plot customization options in matplotlib and describe their purpose.

PART – B

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

9. Analyze various categories of operators in Python with suitable examples and outputs. **(10)**

10. Apply conditional control statements (*if, elif, else*) to develop a grade evaluation program based on marks. Include explanation, syntax format, program and output. **(10)**

11. Develop Python program to demonstrate the use of *for* and *while* loops to: **(10)**
    a. Generate the multiplication table for a given number
    b. Display all prime numbers within a specified range

12. Summarize the characteristics of fundamental Python data structures lists, tuples, sets and dictionaries and illustrate how each is created using example code and program output. **(10)**

Contd...2

13. List frequently occurring runtime exceptions in Python (*TypeError, ValueError, IndexError, KeyError, FileNotFoundError*) and illustrate scenarios demonstrating minimum two types with output. **(10)**

14. Describe why exception handling is important in Python and demonstrate the process of (*try–except–else–finally*) using a calculation-based example with output. **(10)**

15. Demonstrate how to create a Pandas *Series* and *DataFrame* and show operations such as addition, filtering, and basic statistics with program output. **(10)**

16. Construct a line graph and a bar graph using Matplotlib with any sample data and include titles, axis labels, legend and gridlines. Present explanation, Python code and output. **(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
Blooms Level	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3
Mapped CO(s)	1	1	1	2	3	4	5	5	1	1	1	3	5	5	3	5

(2025 Batch Onwards)

25ENUEC159 Reg. No. | | | | | | | | |

St Aloysius (Deemed to be University)
Mangaluru
SCHOOL OF ENGINEERING
(UG Programme)
BTech (CSE/ISE)- Semester I Degree Examination
December – 2025
FUNDAMENTALS OF EMBEDDED SYSTEMS

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

PART – A

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

1. Define an embedded system and give an example from daily life.
2. Identify any two differences between a Microprocessor and a Microcontroller.
3. Explain any two Non-Operational Quality Attributes of an embedded system.
4. Illustrate in brief the State Machine Model.
5. Explain briefly the Open Collector Configuration.
6. Compare a thread and a process in the context of real-time operating systems (RTOs).
7. Mention the function of a Real Time Kernal?

PART – B

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

8. Describe the elements of an embedded system using a neat block diagram and explain their functions. **(10)**
9. Sketch and explain Stepper Motor and Optocoupler. **(10)**
10. Illustrate Characteristics of Embedded Systems. **(10)**
11. Apply the concept of embedded systems to demonstrate the working of an automotive braking system (ABS) using a neat labelled block diagram. **(10)**
12. Design a Finite State Machine (FSM) for an automatic tea/coffee vending machine. The machine should start only after a ₹5 coin is inserted. After inserting the coin, the user can select either 'Tea' or 'Coffee' or cancel the order to get the coin back. Identify and explain the states, inputs, outputs, transitions, and actions of the FSM, Draw a state diagram to illustrate the operation of the machine. **(10)**
13. Describe the applicability of various firmware design approaches for developing a real-time embedded product and analyse the suitability of each approach. **(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
Blooms Level	2	2	2	2	2	2	2	3	3	3	4	4	3
Mapped CO(s)	1	1	2	2	3	3	4	1	1	2	2	3	4

(2025 Batch Onwards)

25ENUHM164 Reg. No. | | | | | | | | |

St Aloysius (Deemed to be University)

Mangaluru

School of Engineering

(UG Programme)

B.Tech (CSE/ISE) - Semester I - Degree Examination

December - 2025

INNOVATION AND DESIGN THINKING

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

Note: 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. **Match the following:**

a. Product Innovation Unlimited	i. Amazon's subscription-based Kindle
b. Process Innovation	ii. Grameen Bank microfinance model
c. Business Model Innovation	iii. Dyson's bladeless fan
d. Social Innovation approach	iv. Tesla's Gigafactory manufacturing

2. In the Design Thinking framework, the phase where you freely generate a wide range of ideas without evaluation is called _____, while the phase focused on creating quick, low-cost models is _____.
   a) Define, Test
   b) Ideate, Prototype
   c) Empathize, Ideate
   d) Prototype, Define
3. Kodak's inability to commercialize the digital camera represents the Innovation barrier of _____, while the stage of the innovation process that involves testing models with users to gather feedback is _____.
   a) Resource limitations, Empathize
   b) Fear of failure, Test
   c) Cultural resistance, Prototype
   d) Regulatory hurdles, Ideate
4. Divergent thinking helps in generating __ _____ ideas, whereas convergent thinking focuses on _____ them to identify the best solution.
   a) wild, combining
   b) many, narrowing
   c) costly, marketing
   d) emotional, ignoring
5. FVD represents Feasibility, _____, and Desirability. The ideal innovation point is found at the _____ of all three.
   a) Visibility, top
   b) Variability, bottom
   c) Viability, intersection
   d) Velocity, beginning
6. Low-fidelity prototypes such as paper sketches are _____ and inexpensive, whereas high-fidelity prototypes are more _____ and closer to the final solution.
   a) fast, detailed
   b) risky, confusing
   c) expensive, unrealistic
   d) hidden, theoretical

Contd...2

7. The Stanford Design Thinking model includes five stages; the first two stages are _____ and _____.
   a) Empathize, Define
   b) Prototype, Test
   c) Inspiration, Implementation
   d) Observe, Survey

PART – B

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

8. Describe why innovation is essential for economic development and social progress, supporting your explanation with a suitable example. Also discuss common barriers to innovation, referring to the Kodak case.
9. Describe the major types of innovation and provide one relevant example for each category.
10. Define Design Thinking. Explain its stages and highlight its significance in approaching and solving complex problems.
11. Elaborate on how the Design Thinking process contributed to the development and success of the Milky Mist business model.
12. Explain the IDEO Design Thinking model and discuss its key components.
13. Describe an Empathy Map and illustrate its application using a case example of your choice.

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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
Blooms Level	3	2	3	2	2	2	2	3	2	2	4	3	3
Mapped CO(s)	1	1	1	2	2	2	1	1	1	1	1	2	2