CMR COLLEGE OF ENGINEERING & TECHNOLOGY
(UGC AUTONOMOUS)

Examination	:	B.Tech V Semester Regular & Supplementary Examinations Nov/Dec-2025
Course Name	:	Computer Networks
Course Code	:	A405310/ A467305/ A466304/ A473303
Branch	:	CSE/ CSD/ CSM/ AIM
Date & Session	:	06-12-2025 AN Duration: 3 hours Max. Marks: 60

(Note: Assume suitable data if necessary)

PART-A
Answer all TEN questions
Each question carries ONE mark.   10x1=10M

1.	Define OSI reference model.	1 M
2.	List the advantages of fiber optic cable.	1 M
3.	What is a sliding window protocol?	1 M
4.	Differentiate between Go-Back-N and Selective Repeat protocols.	1 M
5.	Define flooding in routing algorithms.	1 M
6.	Why does congestion occur in packet-switched networks?	1 M
7.	What are the main services provided by the transport layer?	1 M
8.	Compare TCP and UDP protocols.	1 M
9.	State the purpose of DNS.	1 M
10.	Distinguish between HTTP and HTTPS.	1 M

PART-B
Answer the following. Each question carries TEN Marks.   5x10=50M

11.A).	Explain the functions of each layer in the OSI model with suitable examples.	10M
	OR	
11. B).	Discuss the TCP/IP model and compare it with the OSI reference model.	10M
12. A).	Describe the design issues of the data link layer and explain various error detection methods.	10M
	OR	
12. B).	Outline the working of Go-Back-N and Selective Repeat protocols with timing diagrams.	10M
13. A).	Illustrate different routing algorithms with neat diagrams.	10M
	OR	
13. B).	Analyze the performance of distance vector routing and hierarchical routing in large networks.	10M
14. A).	Summarize the elements of transport protocols and their role in connection management.	10M
	OR	
14. B).	Compare the operation of TCP and UDP with examples from real-time applications.	10M
15. A).	Describe the architecture and working of the Domain Name System.	10M
	OR	
15. B).	Analyze the role of HTTP and SNMP in network applications.	10M

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CMR COLLEGE OF ENGINEERING & TECHNOLOGY
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Examination	:	B.Tech V Semester Regular & Supplementary Examinations Nov/Dec-2025
Course Name	:	DEVOPS
Course Code	:	A405311
Branch	:	Computer Science & Engineering
Date & Session	:	27-11-2025 AN Duration: 3 hours Max. Marks: 60

(Note: Assume suitable data if necessary)

PART-A
Answer all TEN questions
Each question carries ONE mark.   10x1=10M

1.	What is the role of DevOps in project development?	1 M
2.	Define Pipelining in DevOps.	1 M
3.	List DevOps Life-cycle phases.	1 M
4.	How Micro services are better than Monolithic services?	1 M
5.	How to push a file in Git?	1 M
6.	What is Docker intermission?	1 M
7.	How to build Slaves?	1 M
8.	What are the uses of building dependencies?	1 M
9.	How do Ansible modules contribute to the automation process?	1 M
10.	What is client-side validation in Java Script?	1 M

PART-B
Answer the following. Each question carries TEN Marks.   5x10=50M

11.A). Describe release management in DevOps, its challenges, benefits, and real-world examples of successful implementation.   10M

OR

11. B). Explain the significance of Continuous Delivery in DevOps and provide examples of organizations successfully implementing it.   10M

12. A). Explore the challenges and best practices for handling database migrations in DevOps and discuss available tools.   10M

OR

12. B). Explain Devops Software architecture model and Resilience.   10M

13. A). Explain the significance of source code control in project management, its history, and role in version control and collaboration.   10M

OR

13. B). Discuss shared authentication for accessing source code repositories, its implementation, benefits, and associated risks.   10M

(P.T.O..)

14. A). Analyze the importance of file system layout in build server configurations, its impact on the build process and artifact management. 10M

OR

14. B). Explore the features and capabilities of the Jenkins build server, its role in continuous integration and delivery, and the benefits and challenges of using Jenkins in DevOps. 10M

15. A). Discuss REPL-driven development and its benefits for iterative testing and rapid code prototyping. Explain how it aligns with DevOps principles and facilitates faster feedback loops. 10M

OR

15. B). Discuss the role of virtualization stacks, including hypervisors and containerization platforms like Docker, in efficient and scalable application deployment. Discuss Chef and SaltStack. 10M

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CMR COLLEGE OF ENGINEERING & TECHNOLOGY
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Examination	:	B.Tech V Semester Regular & Supplementary Examinations Nov/Dec-2025
Course Name	:	Design and Analysis of Algorithms
Course Code	:	A405302
Branch	:	Computer Science & Engineering
Date & Session	:	29-11-2025 AN Duration: 3 hours Max. Marks: 60

(Note: Assume suitable data if necessary)

PART-A
Answer all TEN questions
Each question carries ONE mark.   10x1=10M

1.	State the difference between Big O and Omega notations.	1 M
2.	Compare Merge Sort and Quick Sort based on their approach and performance.	1 M
3.	Illustrate the purpose of the union operation in disjoint sets.	1 M
4.	Relate the problem-solving technique used in the N-Queens problem.	1 M
5.	Illustrate the main principle used in dynamic programming.	1 M
6.	Write the recurrence relation used in the Floyd–Warshall algorithm.	1 M
7.	Recall the purpose of the single-source shortest path problem.	1 M
8.	Tell one difference between Prim's and Kruskal's algorithms.	1 M
9.	Outline the theorem that introduced NP-Completeness.	1 M
10.	List the characteristics of an NP-Complete problem.	1 M

PART-B
### Answer the following. Each question carries TEN Marks.   5x10=50M

11.A).	i) What is an algorithm? Explain characteristics of an algorithm.	5M
	ii) Explain about Asymptotic notations.	5M

OR

11. B).	Assess how Binary Search operates on a sorted array using the divide and conquer approach. Show all steps and derive its time complexity.	10M
12. A).	Make Use of backtracking to find all possible solutions to the sum of subsets problem for a given set of integers.	10M

OR

|		
12. B).	Define Priority Queue. Construct max heap for the following elements 56,34,89,23,76,45,66,50	10M
13. A).	Solve the Traveling Salesperson Problem for a 4-city network using dynamic programming. Show all stages of computation and derive the minimum cost tour.	10M

(P.T.O..)
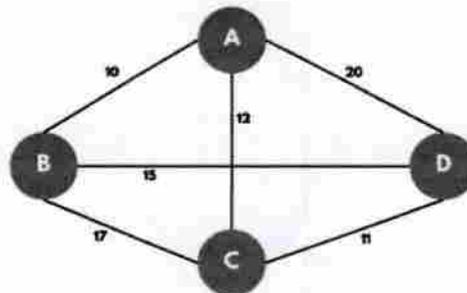
13. B). Apply the dynamic programming approach to solve the 0/1 Knapsack problem for four   10M
items with the following details:

Item 1 has weight 1 and profit 1,
Item 2 has weight 3 and profit 4,
Item 3 has weight 4 and profit 5,
Item 4 has weight 5 and profit 7.
The capacity of the knapsack is 7.

Formulate the recursive relation, construct the dynamic programming table, and determine:

i)   The maximum profit obtained, and
ii) The set of items included in the optimal solution.

14. A). Apply the greedy algorithm to solve the Job Sequencing with Deadlines problem for the   10M
following set of jobs.

Each job takes one unit of time. Find the optimal sequence of jobs and the total profit.

Job	Deadline	Profit
J1	2	100
J2	1	19
J3	2	27
J4	1	25
J5	3	15

OR

14. B). Make use of the given undirected graph, apply DFS to identify and mark all connected   10M
components.

Show step-by-step traversal order and illustrate the resulting components.
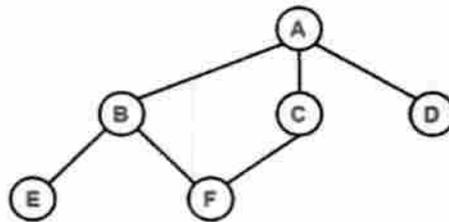
15. A). Evaluate the significance of Cook's theorem in establishing NP-Completeness and explain   10M
its impact on computational complexity theory.

OR

15. B). Analyse the role of non-deterministic algorithms in identifying NP-Complete problems   10M
and discuss how they differ from deterministic algorithms.

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CMR COLLEGE OF ENGINEERING & TECHNOLOGY
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Examination	:	B.Tech V Semester Regular & Supplementary Examinations Nov/Dec-2025
Course Name	:	Data Analytics
Course Code	:	A405420
Branch	:	Computer Science & Engineering
Date & Session	:	02-12-2025 AN Duration: 3 hours Max. Marks: 60

(Note: Assume suitable data if necessary)
PART-A
Answer all TEN questions
Each question carries ONE mark.   10x1=10M

1. Define outlier and give one real time example.   1 M
2. Define Data management.   1 M
3. Name the any two tools used for data analytics.   1 M
4. List various types of analytics.   1 M
5. Define variable rationalization.   1 M
6. Which mathematical approach to create a statistical model to forecast future behavior-based   1 M
    input text data?
7. How do train the model using supervised learning technique.   1 M
8. Write any two differences between linear and logistic regression.   1 M
9. Define Chernoff faces.   1 M
10. List out five factors that influence data visualization choices.   1 M

PART-B
Answer the following. Each question carries TEN Marks.   5x10=50M

11.A). Build the Factors that influence Data Architecture with neat diagram.   10M

OR

11. B). Identify the steps and actual data to understand various sources of the data.   10M

12. A). Discover the ways to use data analytics and the steps involved in data analytics.   10M

OR

12. B). Define data analytics. List and explain types of variables and data types in analytics.   10M

13. A). Develop the properties and assumptions of OLS approximation and plan the assumptions   10M
        of OLS regression.

OR

13. B). Organize various analytics applications to various Business Domains.   10M

14. A). Compare and contrast Supervised & Unsupervised Learning.   10M

OR

14. B). Functions and Methodologies of Segmentation approach in Data Analytics.   10M

15. A). Inference the methods of Hierarchical Visualization Techniques.   10M

OR

15. B). Explain pixel-oriented visualization technique in detail with case study.   10M

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CMR COLLEGE OF ENGINEERING & TECHNOLOGY
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Examination	:	B.Tech V Semester Supplementary Examinations Nov/Dec-2025
Course Name	:	Principles of Programming Languages
Course Code	:	A405403
Branch	:	Computer Science & Engineering
Date & Session	:	02-12-2025 AN Duration: 3 hours Max. Marks: 60

(Note: Assume suitable data if necessary)

PART-A
Answer all TEN questions
Each question carries ONE mark.   10x1=10M

1.	Define syntax and semantics.	1 M
2.	Explain the term "Attribute Grammar".	1 M
3.	What is a named constant?	1 M
4.	What is type checking?	1 M
5.	Define a subprogram and block.	1 M
6.	What is the concept of abstraction?	1 M
7.	What is statement-level concurrency?	1 M
8.	List languages that support concurrency.	1 M
9.	Give examples of functional programming languages.	1 M
10.	What is a module library?	1 M

PART-B
Answer the following. Each question carries TEN Marks.   5x10=50M

11.A).	Describe language evaluation criteria and factors influencing language design.	10M
	OR	
11. B).	What are attribute grammars? Explain their role in defining semantics.	10M
12. A).	Describe data types and type checking in programming languages.	10M
	OR	
12. B).	Write short notes on type conversion and overloaded operators.	10M
13. A).	Discuss different parameter passing methods with examples.	10M
	OR	
13. B).	Explain stack-dynamic local variables and nested subprograms.	10M
14. A).	Discuss concurrency mechanisms in function languages.	10M
	OR	
14. B).	Describe exception handling in Ada, C++, and Java.	10M
15. A).	Compare functional and imperative languages.	10M
	OR	
15. B).	Explain scripting language pragmatics and key concepts.	10M

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CMR COLLEGE OF ENGINEERING & TECHNOLOGY
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Examination	:	B.Tech V Semester Regular & Supplementary Examinations Nov/Dec-2025
Course Name	:	Full Stack Development
Course Code	:	A405312/ A467403
Branch	:	CSE/ CSD
Date & Session	:	04-12-2025 AN Duration: 3 hours Max. Marks: 60

(Note: Assume suitable data if necessary)

PART-A
Answer all TEN questions
Each question carries ONE mark.   10x1=10M

1.	Name any two examples of web servers.	1 M
2.	What command is used to check the version of Node.js installed?	1 M
3.	What data format is JSON based on?	1 M
4.	Which module in Node.js allows you to connect to databases using a DSN?	1 M
5.	Name any two basic data types supported by MongoDB.	1 M
6.	What is the main purpose of NoSQL databases?	1 M
7.	What command is used to install Express.js?	1 M
8.	What is the purpose of creating a custom directive in Express.js?	1 M
9.	What is meant by a single-page application (SPA) in React.js?	1 M
10.	What is the purpose of the DOM in a web application?	1 M

PART-B
Answer the following. Each question carries TEN Marks.   5x10=50M

11.A).	Describe the role of JavaScript Framework in web development.	10M
	OR	
11. B).	i) How would you create a new Node.js project using npm init?	3M
	ii) Explain the full stack components (MERN).	7M
12. A).	Explain the importance of HTTP module for validating query and form parameters on the client and server side.	10M
	OR	
12. B).	Describe how the crypto module enhances application security.	10M
13. A).	Explain the purpose of connecting MongoDB to a Node.js application.	10M
	OR	
13. B).	How would you create a new collection in MongoDB using the Mongo shell or Node.js?	10M
14. A).	How would you create a new Angular project in web application using Angular Services?	10M
	OR	
14. B).	Describe the difference between structural directives and attribute directives in Angular.	10M
15. A).	Describe the difference between a class component and a functional component in React.js.	10M
	OR	
15. B).	i) How would you create a simple login form using controlled components in React.js?	5M
	ii) Describe the rendering and life cycle method in React.js.	5M

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CMR COLLEGE OF ENGINEERING & TECHNOLOGY
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Examination	:	B.Tech V Semester Supplementary Examinations Nov/Dec-2025
Course Name	:	Data Communications and Computer Networks
Course Code	:	A412305
Branch	:	Information Technology
Date & Session	:	06-12-2025 AN Duration: 3 hours Max. Marks: 60

(Note: Assume suitable data if necessary)

PART-A
Answer all TEN questions
Each question carries ONE mark.   10x1=10M

1.	List any four topologies used in networks.	1 M
2.	Define Multiplexing.	1 M
3.	What is the significance of HDLC protocol?	1 M
4.	What is IEEE 802.5?	1 M
5.	Define Internetworking.	1 M
6.	What is the purpose of the ICMP protocol in networking?	1 M
7.	Sketch UDP Datagram.	1 M
8.	What are the QoS parameters used in Frame Relay networks?	1 M
9.	What are the key components in SMTP protocol?	1 M
10.	What is the purpose of www?	1 M

PART-B
Answer the following. Each question carries TEN Marks.   5x10=50M

11.A).	What are the different layers in the OSI Reference Model? Explain the functionalities of each Layer.	10M

OR

11. B).	Describe and compare different types of transmission media with neat diagrams, explaining their characteristics and uses.	10M
12. A).	Apply the CRC method to detect an error/s if any, with the given data word "1010011110", divisor "10111" and received codeword "10100111101100". Give its correcting method.	10M

OR

12. B).	What is the purpose of CSMA/CD? Explain it.	10M
13. A).	What is the format of IPv4 header? Describe the significance of each field.	10M

OR

13. B).	Distinguish between Distance Vector Routing and Link State Routing Protocols.	10M
14. A).	List the different congestion control techniques and explain any one of them briefly.	10M

OR

14. B).	Explain the concept of Differentiated Services and how it manages QoS in modern networks.	10M
15. A).	Define Network Management. List and explain the functions of Network Management.	10M

OR

15. B).	Explain the role of Domain name service in Internet.	10M

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CMR COLLEGE OF ENGINEERING & TECHNOLOGY
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Examination	:	B.Tech V Semester Supplementary Examinations Nov/Dec-2025
Course Name	:	Software Engineering
Course Code	:	A412306
Branch	:	Information Technology
Date & Session	:	27-11-2025 AN

Duration: 3 hours   Max. Marks: 60

(Note: Assume suitable data if necessary)

PART-A
Answer all TEN questions
Each question carries ONE mark.   **10x1=10M**

1. List the Process Model.   1 M
2. Define Software Engineering.   1 M
3. Describe requirements validation.   1 M
4. Differentiate between user requirements and system requirements.   1 M
5. Recall the meaning of class diagram?   1 M
6. State the purpose of software architecture.   1 M
7. Mention an Example for validation testing.   1 M
8. Distinguish White and black-box testing.   1 M
9. Define Risk projection.   1 M
10. Spell the concern of software quality assurance.   1 M

PART-B
Answer the following. Each question carries TEN Marks.   **5x10=50M**

11.A). Describe in detail the Capability Maturity Model Integration (CMMI)   10M

OR

11. B). Develop a simple Agile-based process framework for a small software project.   10M

12. A). Evaluate the importance of interface specification in software systems   10M

OR

12. B). Explain the various types of software requirements with examples.   10M

13. A). Show and discuss the architectural styles and patterns with suitable examples.   10M

OR

13. B). Compare conceptual model and architectural design.   10M

14. A). List out the phases of system testing and analyze.   10M

OR

14. B). Explicate the importance of metrics in software quality assurance.   10M

15. A). Explain reactive vs proactive risk strategies.   10M

OR

15. B). Discuss the components of a Risk Mitigation, Monitoring, and Management (RMMM) plan.   10M

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CMR COLLEGE OF ENGINEERING & TECHNOLOGY
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Examination	:	B.Tech V Semester Regular & Supplementary Examinations Nov/Dec-2025	
Course Name	:	Machine Learning	
Course Code	:	A412307/ A467303/ A466303/ A473302	
Branch	:	IT/ CSD/ CSM/ AIM	
Date & Session	:	29-11-2025 AN Duration: 3 hours	Max. Marks: 60

(Note: Assume suitable data if necessary)

PART-A
Answer all TEN questions
Each question carries ONE mark.   10x1=10M

1.	Define unsupervised learning and give an example.	1 M
2.	Explain the difference between classification and regression	1 M
3.	How are weights and biases used during forward propagation?	1 M
4.	What is the main goal of the backpropagation algorithm?	1 M
5.	How is a decision tree constructed from data	1 M
6.	How does boosting improve the performance of weak learners?	1 M
7.	What are eigenvalues and eigenvectors in the context of Principal Component Analysis?	1 M
8.	Write the basic mathematical expression for least squares error.	1 M
9.	Give one real-world application of reinforcement learning.	1 M
10.	What is a Hidden Markov Model?	1 M

PART-B
Answer the following. Each question carries TEN Marks.   5x10=50M

11.A).	Compare and contrast supervised, unsupervised and reinforcement learning in terms of data requirements, output and applications.	10M

OR

11. B).	Explain the process of finding a maximally specific hypothesis given a set of training examples.	10M
12. A).	Explain how techniques like regularization, dropout and normalization improve Multi-Layer Perceptron performance in practice.	10M

OR

12. B).	Demonstrate techniques like feature selection and dimensionality reduction used to overcome the curse of dimensionality.	10M
13. A).	Illustrate with an example how a decision tree is built for a simple classification problem.	10M

OR

13. B).	What is ensemble learning? Explain how combining multiple models improves accuracy.	10M
14. A).	Discuss the challenges of high-dimensional data and how dimensionality reduction helps overcome them.	10M

OR

14. B).	Demonstrate how hybrid approaches combine Genetic Algorithms with other optimization methods.	10M

(P.T.O..)

15. A). Define reinforcement learning (RL). Explain its main components — agent, environment,   10M
policy, reward, and value function — with a neat diagram.

OR

15. B). Define a Bayesian Network. Explain its structure and components (nodes, edges, and   10M
conditional probability tables).

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CMR COLLEGE OF ENGINEERING & TECHNOLOGY
(UGC AUTONOMOUS)

Examination	: B.Tech V Semester Supplementary Examinations Nov/Dec-2025
Course Name	: Automata Theory and Compiler Design
Course Code	: A412303
Branch	: Information Technology
Date & Session	: 02-12-2025 AN Duration: 3 hours Max. Marks: 60

(Note: Assume suitable data if necessary)

PART-A
Answer all TEN questions

Each question carries ONE mark.   10x1=10M

1.	What is ε-closure ?	1 M
2.	Differentiate between NFA and DFA.	1 M
3.	Construct N.F.A for the regular expression $(a+b)^*baa$.	1 M
4.	What are the decision properties of regular languages.	1 M
5.	Encode the following transition of a Turing machine	1 M

$\delta(q_2, 0)=(q_1, 1, L)$

6.	Differentiate between recursive and recursively enumerable language.	1 M
7.	Construct transition diagram to identify floating point numbers.	1 M
8.	Verify the following grammar LL (1) or not.	1 M

$S \rightarrow AaAb \mid BbBa$

$A \rightarrow \varepsilon$

$B \rightarrow \varepsilon$

9.	$E \rightarrow E+T/T$ { E.val=E.val+T.Val , T.Type=E.type} Identify synthesized and inherited attributes in the above SDD and justify your answer.	1 M
10.	What is register allocation and register assignment.	1 M

PART-B
Answer the following. Each question carries TEN Marks.   5x10=50M

11.A). Convert the following NFA to DFA.   10M

	0	1
→ p	$\{p, q\}$	$\{p\}$
q	$\{r, s\}$	$\{t\}$
r	$\{p, r\}$	$\{t\}$
*s	$\emptyset$	$\emptyset$
*t	$\emptyset$	$\emptyset$

OR

11. B). Design a DFA which accepts the strings over {a, b} whose length is divisible by 4.   10M

(P.T.O..)

12. A). Define and prove Pumping Lemma for Regular Languages. Prove that $L = \{a^n b^n \mid n>0\}$ is 10M
not Regular.

OR

12. B). Convert the following DFA into regular expression using state elimination method 10M

	0	1
$\rightarrow q_1$	q_2	q_1
q_2	q_3	q_1
$*q_3$	q_3	q_2

13. A). Construct pushdown automata for the following grammar 10M

$S \rightarrow aAA$

$A \rightarrow aS/bS/a$

OR

13. B). Construct Turing machine for $\{a^n b^n c^n /n>=1\}$ 10M

14. A). Construct finite automata to recognize relational operators. 10M

OR

14. B). Discuss algorithms to construct FIRST and FOLLOW set and find FIRST and FOLLOW 10M
for following grammar
$E \rightarrow E+T/T$
$T \rightarrow T*F/ F$
$F \rightarrow (E)/id$

15. A). Construct Dependency graph for a declaration float id_1, id_2, id_3 using the following SDD 10M

$D \rightarrow T L$	L.inh = T.type
$T \rightarrow int$	T. type = integer
$T \rightarrow float$	T.type = float
$L \rightarrow L_1$, id	L_1.inh=L.inh, addType(id.entry, L.inh)
$L \rightarrow id$	add Type(id entry, L.inh)

OR

15. B). What is DAG? Construct the DAG for basic block given below and identify common sub 10M
expression
a =b+ c
c =a+ d
d =b+ c
e= d- b
a =e+ b

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CMR COLLEGE OF ENGINEERING & TECHNOLOGY
(UGC AUTONOMOUS)

Examination	:	B.Tech V Semester Regular & Supplementary Examinations Nov/Dec-2025
Course Name	:	Advanced Computer Architecture
Course Code	:	A412401
Branch	:	Information Technology
Date & Session	:	04-12-2025 AN Duration: 3 hours Max. Marks: 60

(Note: Assume suitable data if necessary)
PART-A
Answer all TEN questions
Each question carries ONE mark.   10x1=10M

1.	What is multiple processor?	1 M
2.	What are the conditions of Parallelism?	1 M
3.	State Amdahl's Law.	1 M
4.	What are the hardware technologies?	1 M
5.	What is a superscalar pipeline?	1 M
6.	What is Sequential Consistency?	1 M
7.	What is message passing?	1 M
8.	What are the three generations of multicomputers?	1 M
9.	List any two benefit of compound vector processing.	1 M
10.	What are the different types of SIMD?	1 M

PART-B
Answer the following. Each question carries TEN Marks.   5x10=50M

11.A).	Explain in detail Parallel Random-Access Machines and VLSI Models.	10M
	OR	
11. B).	Discuss in detail Multivector and SIMD Computers.	10M
12. A).	Discuss in detail about parellel processing applications.	10M
	OR	
12. B).	Explain in detail about superscalar and vector processors.	10M
13. A).	Discuss in detail Linear pipeline Processors.	10M
	OR	
13. B).	Discuss in detail about Instruction Pipeline Design.	10M
14. A).	Illustrate various parallel architectures.	10M
	OR	
14. B).	Discuss in detail about cache coherence and synchronization mechanism.	10M
15. A).	Explain in detail vector processing principles.	10M
	OR	
15. B).	Discuss in detail multivector multiprocessor system.	10M

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CMR COLLEGE OF ENGINEERING & TECHNOLOGY
(UGC AUTONOMOUS)

Examination	:	B.Tech V Semester Regular & Supplementary Examinations Nov/Dec-2025
Course Name	:	Formal Languages & Automata Theory
Course Code	:	A462306
Branch	:	CSC
Date & Session	:	27-11-2025 AN Duration: 3 hours Max. Marks: 60

(Note: Assume suitable data if necessary)

PART-A
Answer all TEN questions
Each question carries ONE mark.   10x1=10M

1.	Write any two applications of finite automata.	1 M
2.	Define ε-closure of a state.	1 M
3.	Give an example of a regular expression over $\Sigma = \{0,1\}$.	1 M
4.	How do we test the equivalence of two DFAs?	1 M
5.	List the components of a CFG.	1 M
6.	Give an example of a CFL and its corresponding PDA.	1 M
7.	What is meant by a useless symbol in a CFG?	1 M
8.	Are CFLs closed under union? Justify.	1 M
9.	What is a Multi-tape Turing Machine?	1 M
10.	How many counters are needed for a Turing Machine equivalent counter machine?	1 M

PART-B
Answer the following. Each question carries TEN Marks.   5x10=50M

11.A). Convert the following NFA with ε moves to DFA without ε moves. Initial state= {q} final   10M
state = {s}

OR

11. B). Convert the following Mealy machine into its equivalent Moore machine.   10M

Present State	I/P=0		I/P=1	
	Next State	O/P	Next State	O/P
→ A	C	0	B	0
B	A	1	D	0
C	B	1	A	1
D	D	1	C	0

(P.T.O..)

12. A). Explain about Arden's theorem, for constructing the RE from a FA with an example. 10M
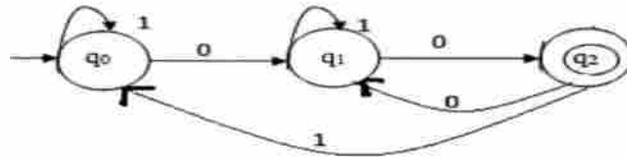
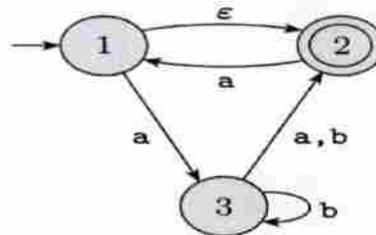OR

12. B). Write the process of equivalence two FA's? Find whether the equivalence two FA's or not. 10M
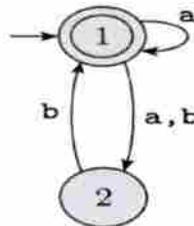
(a)   (b)

13. A). Write the procedure and Eliminate left recursion from the following Grammar. Verify for the string id+id*id. 10M

$$E \rightarrow E+T|T$$
$$T \rightarrow T*F|F$$
$$F \rightarrow (E)|id$$

OR

13. B). i) Convert the following CFG to an equivalent PDA 5M
$S \rightarrow aSb \mid bSa \mid \varepsilon$
ii) Explain the construction method (CFG to PDA) and illustrate the operation of the PDA for the input string abba. 5M

14. A). Convert the following grammar into Greibach normal form. 10M
$$S \rightarrow AA|a$$
$$A \rightarrow SS|b$$

OR

14. B). Given the CFG 10M
$S \rightarrow AB \mid a$
$A \rightarrow aA \mid \varepsilon$
$B \rightarrow bB \mid C$
$C \rightarrow cC \mid \varepsilon$. Determine whether the language generated by this grammar is empty, finite, or infinite. Justify each step clearly.

15. A). Explain the different types of Turing Machines and Design a two-tape TM that accepts 10M
$L = \{a^n b^n \mid n \geq 1\}$.

OR

15. B). State PCP. Solve the following PCP instance and check if a match exists: 10M
A=[ab,a,baa],
B=[a,aba,aa]
Show all possible sequences.

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CMR COLLEGE OF ENGINEERING & TECHNOLOGY
(UGC AUTONOMOUS)

Examination	:	B.Tech V Semester Regular & Supplementary Examinations Nov/Dec-2025
Course Name	:	Algorithm Design and Analysis
Course Code	:	A462304
Branch	:	CSC
Date & Session	:	29-11-2025 AN Duration: 3 hours Max. Marks: 60

(Note: Assume suitable data if necessary)

PART-A
Answer all TEN questions
Each question carries ONE mark. 10x1=10M

1.	Define an Algorithm.	1 M
2.	Write the worst-case time complexity of Quick sort.	1 M
3.	What is find operation?	1 M
4.	Define Hamilton Cycle.	1 M
5.	What is an optimal solution?	1 M
6.	Define Reliability Design.	1 M
7.	Write the properties of binary tree.	1 M
8.	What is minimum spanning tree?	1 M
9.	What is NP complete problem?	1 M
10.	List the applications of branch and bound.	1 M

PART-B
Answer the following. Each question carries TEN Marks. 5x10=50M

11.A).	i) Write an algorithm to find reverse of a given number.	5M
	ii) Explain about Asymptotic notation with examples.	5M

OR

11. B).	Explain Merge Sort with an example and derive its time complexity.	10M

12. A).	i) Write algorithm for union operation.	5M
	ii) Construct min heap for the following elements 56,34,89,23,76,45,66,50	5M

OR

12. B).	i) Explain N-queens problem with an example.	7M
	ii) Solve the sum of subsets problem for the following data	3M
	Set = {1, 9, 7, 5, 18, 12, 20, 15} sum value = 35	

13. A).	Solve the following 0/1 Knapsack Problem using dynamic programming n=4, m=30, (w1,w2,w3,w4) = (10,15,6,9) and (p1, p2, p3, p4) = (2,5,8,1).	10M

OR

13. B).	For the following graph obtain the optimum cost tour TSP using Dynamic programming	10M

14. A). Explain Graph traversals with an example for each.   10M

OR

14. B). i) Find single source shortest path problem by taking source as 'S'.   6M
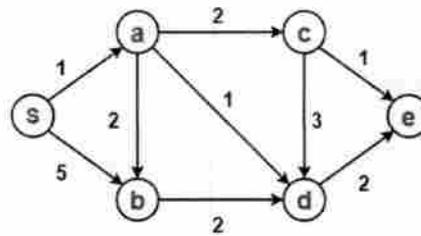
         ii) Write about Biconnected components and give example.   4M

15. A). i) Explain nondeterministic algorithm? Write an algorithm for satisfiability problem.   5M

         ii) Explain Cook's Theorem.   5M

OR

15. B). Solve the 0/1 knapsack problem using Least cost branch and bound method for the   10M
         following data M=15 n=4 (p1,p2,p3,p4) = (10,10,12,18) (w1,w2,w3,w4)=(2,4,6,9)

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CMR COLLEGE OF ENGINEERING & TECHNOLOGY
(UGC AUTONOMOUS)

Examination	:	B.Tech V Semester Regular & Supplementary Examinations Nov/Dec-2025
Course Name	:	Cyber Crime Investigation & Digital Forensics
Course Code	:	A462305
Branch	:	CSC
Date & Session	:	02-12-2025 AN Duration: 3 hours Max. Marks: 60

(Note: Assume suitable data if necessary)

PART-A
Answer all TEN questions
Each question carries ONE mark.   10x1=10M

1.	Define digital evidence.	1 M
2.	What is the purpose of CPPA act?	1 M
3.	List out the steps for conducting a digital investigation.	1 M
4.	Write the importance of surveying digital crime scene.	1 M
5.	Identify crime scene characteristics.	1 M
6.	What is meant by digital evidence as an alibi?	1 M
7.	What is cyberstalking?	1 M
8.	Write Linux command used to know the information about a hard drive and its partitions.	1 M
9.	Mention different technologies that are used to transmit the data through radio waves in a cellular network.	1 M
10.	What is the role of network to gather digital evidences on data-link layer?	1 M

PART-B
Answer the following. Each question carries TEN Marks.   5x10=50M

11.A).	Categorize the computer systems that are used as a source of digital evidences helpful in an investigation.	10M

OR

11. B).	Write a short note on the chain of custody and evidence integrity authentication of a digital evidence.	10M
12. A).	Analyze about staircase digital investigative process model with a neat sketch.	10M

OR

12. B).	Explore various digital crime scene evidence preserving strategies practiced by a digital investigator.	10M
13. A).	Explain how the anonymity provided by computers, mobiles, networks and the internet can contributes to a violent crime?	10M

OR

13. B).	Describe different types of digital evidence that can help to establish an alibi.	10M
14. A).	Discuss various stages that are involved in investigating a cyberstalking case.	10M

OR

14. B).	Demonstrate how the available evidences of Windows file systems (FAT, NTFS) facilitate to the forensic examination?	10M

(P.T.O..)

15. A). Summarize the working process of network and transport layers on digital evidence. 10M

OR

15. B). Describe how TCP/IP related information such as authentication logs, application logs, 10M
network device logs and operating system logs are useful in an investigation.

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CMR COLLEGE OF ENGINEERING & TECHNOLOGY
(UGC AUTONOMOUS)

Examination	:	B.Tech V Semester Regular & Supplementary Examinations Nov/Dec-2025
Course Name	:	Network Security and Cryptography
Course Code	:	A462303
Branch	:	CSC
Date & Session	:	06-12-2025 AN Duration: 3 hours Max. Marks: 60

(Note: Assume suitable data if necessary)
PART-A
Answer all TEN questions
Each question carries ONE mark.   10x1=10M

1.	Define security services.	1 M
2.	What is asymmetric key cryptography?	1 M
3.	What is DES?	1 M
4.	Define the concept of key exchange in cryptography.	1 M
5.	What is a digital signature?	1 M
6.	Define public-key infrastructure (PKI).	1 M
7.	Define wireless network security.	1 M
8.	How is Wi-Fi security managed in 802.11?	1 M
9.	What is an Authentication Header (AH)?	1 M
10.	Define Single Sign-On (SSO).	1 M

PART-B
Answer the following. Each question carries TEN Marks.   5x10=50M

11.A).	Explain the principles of security and how they help ensure secure communication.	10M
	OR	
11. B).	Describe substitution and transposition techniques with examples and explain their role in cryptography.	10M
12. A).	Compare DES and AES, explaining the strengths and weaknesses of each cipher.	10M
	OR	
12. B).	(i). Perform Encryption and Decryption using RSA algorithm for the following: p=3, q=11, e=7, m=5.	7M
	(ii). What attacks are possible on RSA algorithm?	3M
13. A).	Discuss digital signatures with Elgamal public key cryptosystem with a detailed example.	10M
	OR	
13. B).	Discuss the X.509 Authentication Service and its role in Public Key Infrastructure (PKI).	10M
14. A).	Discuss the importance of transport-level security and describe key web security considerations.	10M
	OR	
14. B).	Explain the IEEE 802.11 Wireless LAN standards and their security implications in modern networks.	10M

(P.T.O..)

15. A). Discuss the S/MIME standard and how it provides confidentiality, integrity and   10M
       authentication in email.

OR

15. B). Analyze the security concerns in virtual elections and discuss cryptographic methods that   10M
       can help secure them.

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CMR COLLEGE OF ENGINEERING & TECHNOLOGY
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Examination	:	B.Tech V Semester Regular & Supplementary Examinations Nov/Dec-2025
Course Name	:	Cyber Laws
Course Code	:	A462404
Branch	:	CSC
Date & Session	:	04-12-2025 AN Duration: 3 hours Max. Marks: 60

(Note: Assume suitable data if necessary)

PART-A
Answer all TEN questions
Each question carries ONE mark.   10x1=10M

1.	What is a cybercrime?	1 M
2.	Who invented the World Wide Web?	1 M
3.	Define Digital Signature.	1 M
4.	What is e-governance?	1 M
5.	What is phishing?	1 M
6.	Mention two differences between cybercrime and cyber fraud.	1 M
7.	What is the role of the Indian Computer Emergency Response Team?	1 M
8.	What does Cyber Appellate Tribunal deal with?	1 M
9.	Give any two examples of a cybercrime.	1 M
10.	State one basic rule for safe computer operation.	1 M

PART-B
Answer the following. Each question carries TEN Marks.   5x10=50M

11.A). Discuss in detail the need for cyber law. Support your answer with real-world examples of   10M
cybercrimes.

OR

11. B). Evaluate how the IT Act, 2000 amended other existing laws in India. Give suitable   10M
examples.

12. A). Discuss the penalties and offences under the IT Act, 2000. Give examples of specific   10M
offences and their punishments.

OR

12. B). Compare and contrast digital signature and electronic signature under the IT Act, 2000.   10M

13. A). Evaluate the impact of cyberfraud's on individuals, businesses, and governments in the   10M
digital era.

OR

13. B). Explain the concept of cybercrime. Describe various categories of cybercrimes with   10M
suitable examples.

14. A). Discuss the role and functions of the Department of Electronics and Information   10M
Technology in promoting e-governance and digital transformation in India.

OR

14. B). Analyze the importance of ICERT in national cyber security management. Illustrate with   10M
examples of major cyber incidents handled by ICERT.

(P.T.O..)

15. A). Explain the step-by-step procedure to report a cybercrime in India through the National   10M
Cybercrime Reporting Portal.

OR

15. B). Explain how the Criminal Law (Amendment) Act, 2013 addresses online harassment and   10M
cyberstalking.

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CMR COLLEGE OF ENGINEERING & TECHNOLOGY
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Examination	:	B.Tech V Semester Regular & Supplementary Examinations Nov/Dec-2025
Course Name	:	Big Data Analytics
Course Code	:	A467302
Branch	:	CSD
Date & Session	:	27-11-2025 AN

Duration: 3 hours   **Max. Marks: 60**

(Note: Assume suitable data if necessary)

PART-A
Answer all TEN questions
Each question carries ONE mark.   10x1=10M

1.	Define the term Big Data.	1 M
2.	Identify any two terminologies used in Big Data environments.	1 M
3.	State one key advantage of Hadoop over traditional RDBMS.	1 M
4.	How does Hadoop ensure fault tolerance in data storage?	1 M
5.	Select a suitable type of NoSQL database for an e-commerce recommendation system.	1 M
6.	Define the function of a Reducer in the MapReduce framework.	1 M
7.	Define a collection in MongoDB.	1 M
8.	Identify one feature that differentiates MongoDB from RDBMS.	1 M
9.	Define a matrix in R.	1 M
10.	State the use of the apply() function in R.	1 M

PART-B
Answer the following. Each question carries TEN Marks.   5x10=50M

11.A).	Evaluate the importance of Big Data Analytics in modern organizations	10M
	OR	
11. B).	Analyze the key challenges that prevent businesses from capitalizing on Big Data and propose possible solutions.	10M
12. A).	Explain in detail about Hadoop overview.	10M
	OR	
12. B).	i) Compare RDBMS and Hadoop with respect to scalability and data storage.	5M
	ii) Explain the need for Hadoop in solving distributed computing challenges.	5M
13. A).	Compare and contrast SQL, NoSQL, and NewSQL in terms of performance, consistency, and scalability.	10M
	OR	
13. B).	Develop a pseudo-code or flowchart for a simple MapReduce job.	10M
14. A).	i) Demonstrate how MongoDB queries can be used to retrieve and update documents.	5M
	ii) Compare MongoDB's schema design with that of traditional relational databases.	5M
	OR	
14. B).	Analyze the necessity of MongoDB for handling unstructured data.	10M
15. A).	Evaluate the role of R in data science and analytics.	10M
	OR	
15. B).	Design an R function that demonstrates the use of control structures and the apply family for data processing.	10M

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CMR

CMR COLLEGE OF ENGINEERING & TECHNOLOGY
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Examination	:	B.Tech V Semester Regular & Supplementary Examinations Nov/Dec-2025
Course Name	:	Introduction to Data Science using R
Course Code	:	A467304
Branch	:	CSD
Date & Session	:	02-12-2025 AN

Duration: 3 hours   Max. Marks: 60

(Note: Assume suitable data if necessary)

PART-A
Answer all TEN questions
Each question carries ONE mark.   10x1=10M

1.	How can organizations move beyond the hype of Data Science?	1 M
2.	Mention advantage of using R for statistical analysis.	1 M
3.	Differentiate between qualitative and quantitative attributes.	1 M
4.	Define mean and mention one limitation of using it.	1 M
5.	Perform vector addition on c(2, 4, 6) and c(1, 3, 5).	1 M
6.	What is the difference between a factor and an ordered factor?	1 M
7.	How do relational operators behave when applied to vectors?	1 M
8.	How do you load a package in R?	1 M
9.	What is the primary purpose of using charts and graphs in data analysis?	1 M
10.	How can you identify correlations using a scatter plot?	1 M

PART-B
Answer the following. Each question carries TEN Marks.   5x10=50M

11.A).	What is Data Science and Big Data? Why Data Science is Hype now a days? Why not in the earlier.	10M

OR

11. B).	i) Explain about data types in R.	6M
	ii) Explain about R programming.	4M
12. A).	What is an Attribute? Give the Briefly Description on Different Types of attributes.	10M

OR

12. B).	How can you Measure central Tendency? Explain with an Example.	10M
13. A).	i) Discuss the Procedure for Creating and Naming Vectors.	6M
	ii) Define data frame with an example programming.	4M

OR

13. B).	Explain about Creating and Manipulating R Arrays using Multi-Dimensional with Sample Program.	10M
14. A).	Describe the different Types of R Operators in detail.	10M

OR

14. B).	Discuss about various Types of Mathematical Functions in Detail.	10M
15. A).	Discuss about Linear regression analysis and Multi Linear regression.	10M

OR

15. B).	Write R Program for Histogram with Customized Bins and Colors and Density Plot.	10M

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CMR COLLEGE OF ENGINEERING & TECHNOLOGY
(UGC AUTONOMOUS)

Examination	:	B.Tech V Semester Regular Examinations Nov/Dec-2025
Course Name	:	Data Warehousing and Business Intelligence
Course Code	:	A467401
Branch	:	CSD
Date & Session	:	04-12-2025 AN Duration: 3 hours Max. Marks: 60

(Note: Assume suitable data if necessary)

PART-A
Answer all TEN questions
Each question carries ONE mark.   10x1=10M

1.	Define a Data Warehouse.	1 M
2.	List any two OLAP operations.	1 M
3.	What is Business Intelligence?	1 M
4.	Interpret the term 'Information Hierarchy'.	1 M
5.	State the purpose of Key Performance Indicators (KPIs).	1 M
6.	Differentiate between BI Architecture and BI Framework.	1 M
7.	What is Mobile BI?	1 M
8.	Give any two features of KNIME.	1 M
9.	Define data privacy in BI systems.	1 M
10.	Mention one legal issue in BI implementation.	1 M

PART-B
Answer the following. Each question carries TEN Marks.   5x10=50M

11.A).	Explain OLAP operations with suitable examples and illustrate how data cube computation is performed.	10M

OR

11. B).	Analyze different data warehouse modelling techniques and compare them in terms of scalability and performance.	10M
12. A).	Explain the Business Intelligence Life Cycle and discuss how data quality issues impact BI outcomes.	10M

OR

12. B).	Evaluate the components and dimensions of BI and justify their role in effective decision-making.	10M
13. A).	Discuss various KPIs and performance metrics used in BI implementations and explain their significance in business decision-making.	10M

OR

13. B).	Examine the cyclic process of intelligence creation and assess how event-driven alerts improve BI efficiency.	10M

(P.T.O..)

14. A). Describe the role of Big Data in advanced BI and analyze how social networks contribute   10M
to BI insights.

OR

14. B). Compare Pentaho and KNIME BI tools in terms of architecture, features, and use cases.   10M

15. A). Explain BI system integration methods and discuss connectivity challenges in BI   10M
implementations.

OR

15. B). Assess the ethical, privacy, and legal issues involved in BI systems and propose strategies   10M
to mitigate them.

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CMR COLLEGE OF ENGINEERING & TECHNOLOGY
(UGC AUTONOMOUS)

Examination	:	B.Tech V Semester Regular & Supplementary Examinations Nov/Dec-2025
Course Name	:	Design and Analysis of Algorithms
Course Code	:	A466302/ A473301
Branch	:	CSM/ AIM
Date & Session	:	27-11-2025 AN Duration: 3 hours Max. Marks: 60

(Note: Assume suitable data if necessary)

PART-A
Answer all TEN questions
Each question carries ONE mark.   10x1=10M

1.	List any two asymptotic notations used in algorithm analysis.	1 M
2.	Recall the method used for fast matrix multiplication based on divide and conquer and give the Time complexity of it?	1 M
3.	Identify the sorting algorithm derived from the heap data structure.	1 M
4.	Compare union and find operations in disjoint sets.	1 M
5.	Name the algorithm used for the all-pairs shortest path problem	1 M
6.	List any two optimization problems solved using dynamic programming.	1 M
7.	List any two real-life applications of the greedy strategy.	1 M
8.	Name any two graph traversal techniques.	1 M
9.	Extend the terms NP and P in computational complexity theory.	1 M
10.	Recall and point out the meaning of a "bound" in the Branch and Bound approach.	1 M

PART-B
Answer the following. Each question carries TEN Marks.   5x10=50M

11.A). Apply the Divide and Conquer technique to solve a given problem and illustrate the steps involved using the Merge Sort algorithm with an example input.   10M

OR

11. B). Analyse the role of performance analysis in algorithm design and evaluate how it influences the selection of appropriate algorithms for large-scale applications.   10M

12. A). Evaluate the performance and limitations of backtracking algorithms when solving graph coloring problems.   10M

OR

12. B). Apply the concept of priority queues to simulate a real-life scheduling problem (e.g., CPU scheduling or task management).   10M

13. A). Solve the 0/1 Knapsack problem using dynamic programming for the following data: 10M
Weights = {2, 3, 4, 5}, Profits = {3, 4, 5, 6}, and Capacity = 5.
Construct the dynamic programming table and determine the maximum profit.

(P.T.O..)

13. B). Apply the Floyd–Warshall algorithm to find the shortest paths between all pairs of vertices for a given weighted graph.   10M

Represent the graph as an adjacency matrix and show intermediate matrices after each iteration.
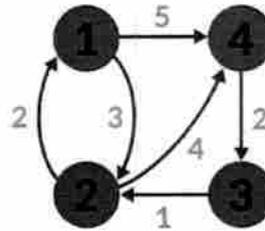
14. A). Make use of the given undirected graph, apply BFS to identify and mark all connected components.   10M

Show step-by-step traversal order and illustrate the resulting components.
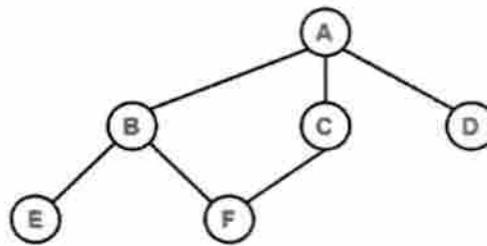
OR

14. B). Solve the following 0/1 Knapsack Problem using a greedy approach (based on profit/weight ratio): Show all steps and justify your selection of items.   10M

Item	Weight	Profit
1	2	10
2	3	5
3	5	15
4	7	7
Capacity of the knapsack = 10.		

15. A). Evaluate the advantages and limitations of the Branch and Bound method when applied to NP-Hard optimization problems.   10M

OR

15. B). Analyse the working of the Branch and Bound technique in solving the Traveling Salesperson Problem. Illustrate each step with a suitable example and diagram.   10M

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CMR **CMR COLLEGE OF ENGINEERING & TECHNOLOGY**
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Examination	:	B.Tech V Semester Regular & Supplementary Examinations Nov/Dec-2025
Course Name	:	**Deep Learning**
Course Code	:	A466305/ A473304
Branch	:	CSM/ AIM
Date & Session	:	02-12-2025 AN

Duration: 3 hours   Max. Marks: 60

(Note: Assume suitable data if necessary)
PART-A
Answer all TEN questions
Each question carries ONE mark.   **10x1=10M**

1.	What is overfitting in machine learning?	1 M
2.	What is the use of validation set in model building?	1 M
3.	State the role of dataset augmentation in training models.	1 M
4.	Identify a method that helps avoid overfitting during training.	1 M
5.	What is the role of pooling in a convolutional neural network?	1 M
6.	Identify any one efficient convolution algorithm and its key benefit.	1 M
7.	List two applications of Long Short-Term Memory (LSTM) networks.	1 M
8.	Mention any one difference between RNN and recursive neural networks.	1 M
9.	Give one example of a debugging strategy used in deep learning.	1 M
10.	What is meant by hyper-parameter tuning?	1 M

PART-B
Answer the following. Each question carries TEN Marks.   **5x10=50M**

11.A). Describe the bias-variance tradeoff with suitable diagrams. How does it affect model performance?   10M

OR

11. B). Why the concept of bias-variance trade-off important? How does it affect model performance and generalization?   10M

12. A). How dropout and dataset augmentation techniques in a deep neural network is employed? Evaluate their effect on model performance.   10M

OR

12. B). Compare and contrast various ensemble methods and justify the role of sparse representations in deep learning.   10M

13. A). Apply the convolution operation using a 3×3 filter K on a 5×5 image matrix I with valid padding and a stride of 1. Show step-by-step computation and resulting feature map.   10M

$$I = \begin{bmatrix} 1 & 2 & 3 & 0 & 1 \\ 0 & 1 & 2 & 3 & 1 \\ 1 & 2 & 1 & 0 & 0 \\ 2 & 1 & 0 & 1 & 2 \\ 1 & 0 & 2 & 3 & 1 \end{bmatrix} \quad K = \begin{bmatrix} 1 & 0 & -1 \\ 1 & 0 & -1 \\ 1 & 0 & -1 \end{bmatrix}$$

OR

13. B). Formulate an experimental setup to compare random feature initialization with unsupervised feature extraction in CNNs.   10M

(P.T.O..)

14. A). Explain the architecture of a standard Recurrent Neural Network (RNN). How is it unrolled in time?   10M

OR

14. B). Examine the problem of long-term dependencies in RNNs. Evaluate how LSTM addresses this issue.   10M

15. A). Evaluate whether gathering more training data or tuning hyper-parameters would be more beneficial in improving model generalization in a scenario of limited validation accuracy.   10M

OR

15. B). Describe the role of large-scale deep learning models in natural language processing (NLP) and how they differ from traditional rule-based systems.   10M

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CMR COLLEGE OF ENGINEERING & TECHNOLOGY
(UGC AUTONOMOUS)

Examination	:	B.Tech V Semester Regular & Supplementary Examinations Nov/Dec-2025
Course Name	:	Advanced Python Programming
Course Code	:	A466402/ A473402
Branch	:	CSM/ AIM
Date & Session	:	04-12-2025 AN Duration: 3 hours Max. Marks: 60

(Note: Assume suitable data if necessary)
PART-A
Answer all TEN questions
Each question carries ONE mark.   10x1=10M

1.	What are Python tokens?	1 M
2.	What is a Python package?	1 M
3.	How do you create a vector using NumPy?	1 M
4.	What are the main data structures in Pandas?	1 M
5.	Name some common modules available in SciPy.	1 M
6.	What function is used to create a histogram?	1 M
7.	Which module in Python is used to connect with MySQL?	1 M
8.	List any three features of Flask.	1 M
9.	What is PyQt?	1 M
10.	How do you install the Beautiful Soup library?	1 M

PART-B
Answer the following. Each question carries TEN Marks.   5x10=50M

11.A).	i) Describe the Python Character Set and the different types of tokens with examples.	5M
	ii) Explain various file reading and writing methods in Python with examples.	5M

OR

11. B).	i) Discuss input and output operations in Python and demonstrate with code examples.	5M
	ii) Write a Python program to count the number of words and lines in a text file.	5M

12. A).	Discuss various methods of creating arrays, vectors, and matrices using NumPy with examples.	10M

OR

12. B).	Differentiate between Series and DataFrame with examples.	10M

13. A).	Write a Python program to draw line, bar and scatter plots with examples.	10M

OR

13. B).	Discuss various methods how to add titles, labels, legends, and styles to a plot in Matplotlib with examples.	10M

14. A).	Explain the steps involved in connecting Python with a MySQL database with example program.	10M

OR

14. B).	Explain how to fetch and process query results using Python with examples.	10M

15. A).	Discuss various types of dialog boxes available in PyQt with examples.	10M

OR

15. B).	Describe the procedure for creating a currency converter GUI application using PyQt.	10M

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CMR COLLEGE OF ENGINEERING & TECHNOLOGY
(UGC AUTONOMOUS)

Examination	:	B.Tech V Semester Supplementary Examinations Nov/Dec-2025
Course Name	:	Foundations of Artificial Intelligence
Course Code	:	A4MD201
Branch	:	Minor in AIML
Date & Session	:	08-12-2025 AN Duration: 3 hours Max. Marks: 60

(Note: Assume suitable data if necessary)

PART-A
Answer all TEN questions
Each question carries ONE mark.   10x1=10M

1. Define Artificial intelligence. What are the applications of Artificial intelligence?   1 M

2. Explain various knowledge representation issues.   1 M

3. Identify the values of TP,TN,FP and FN for the given confusion matrix.   1 M

	Actual Values 1	Actual Values 0
Predicted Values 1	540	150
Predicted Values 0	110	200

4. Distinguish between supervised learning and unsupervised learning. Give an example for each.   1 M

5. Mention some problems that one can face while using a linear regression model.   1 M

6. Explain multiple linear regression with an example.   1 M

7. What are the assumptions in logistic regression?   1 M

8. What is standard error of the regression? Draw a graph to represent the same.   1 M

9. Make use of K-means algorithm and Euclidean distance to cluster the following dataset into 2 clusters: A1= (1,4), A2=(1,3), A3=(0,4), A4=(5,1), A5=(6,2), A6=(4,0).   1 M

10. Illustrate K-Nearest Neighbour learning Algorithm for continues valued target function.   1 M

PART-B
Answer the following. Each question carries TEN Marks.   5x10=50M

11.A). How problem characteristics help in the selection of AI techniques? Explain these with possible examples.   10M

OR

11.B). Show diagrammatically semantic network representing the following knowledge Every vehicle is a physical object. Every car is a vehicle. Every car has four wheels. Electrical system is a part of the car. Battery is a part of electric system. Pollution system is a part of every vehicle. Vehicle is used in transportation. Maruthi is a car.   10M

12.A). Utilize the Baye's Theorem concept to solve the below problem:-
A factory has two Machines-I and II. Machine-I produces 60% of items and Machine-II produces 40% of the items of the total output. Further 2% of the items produced by Machine-I are defective whereas 4% produced by Machine-II are defective. If an item is drawn at random what is the probability that it is defective?   10M

(P.T.O..)

12. B). Build all the metric values for the below Classifier I and Classifier II confusion matrices and find out the best among both the classifiers. 10M

CONFUSION MATRIX FOR CLASSIFIER I

	ACTUAL		
P R E D I C T E D	True Positive (TP) 296	False Positive (FP) 30	pred_has_covid
	False Negative (FN) 34	True Negative (TN) 40	pred_doesnt_hav_covid
	actual_has_covid	actual_doesnt_hav_covid	

CONFUSION MATRIX FOR CLASSIFIER II

	ACTUAL		
P R E D I C T E D	True Positive (TP) 291	False Positive (FP) 22	pred_has_covid
	False Negative (FN) 85	True Negative (TN) 42	pred_doesnt_hav_covid
	actual_has_covid	actual_doesnt_hav_covid	

13. A). Identify the steps required to design a Multiple Linear Regression model to find the profit based on the amount spent on R&D, Administration, Marketing and State tax. 10M

The dataset has information about 50 companies. The main features are the amount spends on various departments such as R&D, Administration, Marketing, State Tax, and Profit of every financial year. The objective is to design a model that predicts which company will have the maximum profit, and what is the most significant feature for predicting the profit of the company.

13. B). Choose the sales of a company (in million dollars) for each year are shown in the table below. 10M

x (year)	2005	2006	2007	2008	2009
y (sales)	12	19	29	37	45

i) Find the least square regression line $y = a x + b$
ii) Find the value of y when x=2010.

14. A). Illustrate how the overfitting is caused and solve the overfitting issue using logistic regression. 10M

14. B). Illustrate how do you create a decision boundary in logistic regression. Explain with an example. 10M

(P.T.O..)

15. A). Assume, you are given a set of one-dimensional data points: {5, 10, 15, 20, 25, 30, 35}. 10M
Assume that $k = 2$ and first set of random centroid is selected as {15, 32} and then it is
refined with {12, 30}.
i) Create two clusters with each set of centroid mentioned above following the k-means
approach.
ii) Calculate the SSE for each set of centroid.

<div align="center">**OR**</div>

15. B). Distinguish between clustering and classification. In what situation the clustering and 10M
classification is used. Create a use case and explain.

<div align="center">*****</div>