

**5E1751**

Roll No. \_\_\_\_\_

[Total No. of Pages : 2]

**5E1751****B.Tech. V-Sem. (Main&Back) Examination, November/December - 2025****Artificial Intelligence****5CS3-01 Information Theory and Coding****CS, CCS, CIT, AI****Time : 3 Hours****Maximum Marks : 70****Instructions to Candidates:**

*Attempt all Ten questions from Part A, Five questions out of Seven questions from Part B and Three questions out of Five questions from Part C.*

*Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.*

*Use of following supporting material is permitted during examination.*

*(Mentioned in form No.205)*

**PART-A****(Answer should be given up to 25 words only)****All questions are compulsory.****(10×2=20)**

1. Define entropy in the context of information theory.
2. What is mutual information?
3. What is the difference between prefix code and block code?
4. Write a short note on Shannon's source coding theorem.
5. Define channel capacity.
6. What is meant by minimum distance of a block code?
7. Define Galois Field (GF) in one line.
8. Write any two properties of cyclic codes.
9. What is a convolutional encoder?
10. Name the three major representations of convolutional codes.

**5E1751 / 435****(1)****[Contd....**

## PART - B

### (Analytical/Problem solving questions)

Attempt any Five questions.

(5×4=20)

1. Derive the expression for entropy for a binary source. Explain uncertainty and information with examples.
2. Explain Huffman coding with an example.
3. Describe the concept of Shannon-Fano coding with a suitable source and probability table.
4. Define linear block codes. Show encoding and decoding using generator and parity-check matrices.
5. Explain the basic polynomial operations over Galois Field (GF).
6. Construct a cyclic code using a given generator polynomial.
7. Draw the code tree and trellis diagram for a rate 1/2 convolutional code.

## PART - C

### (Descriptive/Analytical/Problem Solving/Design questions)

Attempt any Three questions.

(3×10=30)

1. Discuss source and channel coding theorems in detail. Derive expressions and give examples.
2. Explain Huffman and Lempel-Ziv coding. Compare their compression efficiency.
3. Explain systematic and non-systematic linear block codes. How do you convert a non-systematic generator matrix into systematic form?
4. Describe the working of a cyclic encoder and decoder using generating and parity-check polynomials.
5. Explain the Viterbi algorithm for decoding convolutional codes. Derive its logic with an example.

**5E1752**

Roll No. \_\_\_\_\_

[Total No. of Pages : 2]

**5E1752**

**B.Tech. V-Sem. (Main&Back) Examination, November/December - 2025**  
**Artificial Intelligence**  
**5CS4-02 Compiler Design**

**Time : 3 Hours****Maximum Marks : 70****Instructions to Candidates:**

*Attempt All Ten questions from Part A, Five questions out of seven questions from Part B and Three questions out of Five questions from Part C.*

*Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.*

*Use of following supporting material is permitted during examination.  
(Mentioned in form No. 205).*

**PART - A****(Answer should be given up to 25 words only)****All questions are compulsory.****(10×2=20)**

1. Differentiate between an interpreter and a compiler.
2. Explain the role of a lexical analyzer in the compilation process.
3. Apply recursive descent parsing to parse the string "a+a\*b" using grammar rules.
4. What is peephole optimization in compiler design?
5. Compare top-down and bottom-up parsing techniques.
6. What is the purpose of a predictive parser?
7. Justify why SLR parser is preferred over LL parser in some cases.
8. Design a three-address code for the expression :  $a = b * (c + d)$ .
9. Create a simple activation record layout for a function with two parameters and one local variable.
10. What is Bootstrapping in Compiler Design?

**PART - B****(Analytical / Problem Solving questions)****Attempt any Five questions.****(5×4=20)**

1. Design a simple DFA to recognize identifiers in a programming language.
2. Given a basic block with multiple statements, draw its Control Flow Graph (CFG), for  $(i = 0; i < 10; i++)$  {  
     $x = y + z;$   
     $a = a + x;$   
}

**5E1752 / 435****(1)****[Contd....**

3. Given the code:  
 $x = 2 * 3;$   
 $y = x + 0;$   
 Apply peephole optimization and write the optimized code.
4. A function  $\text{sum}(x, y)$  uses two parameters and one local variable. Draw a simple activation record layout and label its components.
5. Identify which intermediate code (postfix/DAG/TAC) suits control structures best.
6. Analyze how a DAG improves code optimization in basic blocks.
7. Given the regular expression  $a(b/c)^*$ , construct a Deterministic Finite Automaton (DFA) to recognize it.

### PART - C

#### (Descriptive / Analytical / Problem Solving / Design questions)

**Attempt any Three questions.**

**(3×10=30)**

1. Design a symbol table structure for a block-structured language supporting:
  - a) Nested functions
  - b) Two types of variables: local and global
  - c) Parameter passing by value and reference
2. Given the following code segment:
 

```
a = b + c;
d = a + e;
b = b + c;
if (b > d)
a = b - d;
```

  - a) Draw the basic blocks and construct the Control Flow Graph (CFG)
  - b) Represent the optimized code using a DAG.
3. Translate the following high-level code into Three Address Code (TAC), Quadruples, and Triples:
 

```
if (a < b)
x = y + z;
else
x = y - z;
```
4. Given the following grammar:
 
$$S \rightarrow aSb \mid \epsilon$$
  - a) Check whether the grammar is ambiguous.
  - b) Construct the parse tree for the input "aabb".
  - c) Convert this grammar into an equivalent LL(1) grammar if needed and build the predictive parsing table.
5. Design a symbol table structure to store entries for a function having:
  - a) Two parameters.
  - b) One global variable.
  - c) Two local variables.

Roll No. \_\_\_\_\_

[Total No. of Pages : 2]

**5E1753****5E1753****B.Tech. V-Sem. (Main&Back) Examination, November/December - 2025****Artificial Intelligence  
5CS4-03 Operating System****Time : 3 Hours****Maximum Marks : 70****Instructions to Candidates:**

*Attempt all Ten questions from Part A, Five questions out of seven questions from Part B and Three questions out of five questions from Part C.*

*Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.*

*Use of following supporting material is permitted during examination.*

*(Mentioned in form No. 205).*

**PART - A****(Answer should be given up to 25 words only)****All questions are compulsory.****(10×2=20)**

1. What is an operating system? Give two examples.
2. What is the difference between user mode and kernel mode?
3. Differentiate between a process and a thread.
4. What is multithreading? Mention one advantage.
5. What is its role in memory management?
6. What is thrashing in operating systems?
7. What is a resource allocation graph?
8. What are the necessary conditions for deadlock?
9. What are access control matrices in file security?
10. What is the role of the I/O scheduler in device management?

**PART - B****(Analytical / Problem Solving Questions)****Attempt any Five questions.****(5×4=20)**

1. If a file system is corrupted due to a crash, what steps would an OS take to recover? Explain.
2. What happens when a high-priority thread enters a system with a currently running low-priority thread? Explain with **priority inversion** example.

**5E1753 / 435****(1)****[Contd....**

3. Simulate a scenario where two processes enter the **critical section** at the same time. How can mutual exclusion solve this
4. A program requires 5 MB of memory, but only 3 MB is available in contiguous blocks. Can it run under paging? Why?
5. A system has 3 processes and 5 resources. Each process holds 1 and needs 2 more. Will deadlock occur? Justify your answer using the **safe state** concept.
6. Given disk requests in the order: 40, 180, 10, 150, 90, 110 and the disk head at 100, calculate total head movement using **SCAN** scheduling.
7. In a multi-user system, how can file security and user authentication prevent unauthorized access to sensitive logs?

### PART - C

(Descriptive / Analytical / Problem Solving / Design Question)

Attempt any Three questions.

(3×10=30)

1. Five processes P1 to P5 arrive at time 0 with the following burst times:  
P1 = 6 ms, P2 = 8 ms, P3 = 7 ms, P4 = 3 ms, P5 = 4 ms.  
Using **Shortest Job First (SJF)** (non-preemptive) scheduling, calculate:
  - a) Average waiting time.
  - b) Average turnaround time.
2. Given the page reference string : 7, 0, 1, 2, 0, 3, 0, 4, 2, 3, 0, 3, 2 and 3 page frames, calculate the number of **page faults** using the **LRU page replacement** algorithm.
3. Consider a system with 3 processes and 4 resource types.

Available resources = (3, 2, 2, 1)

Max matrix and Allocation matrix are:

Process	Max	Allocation
P1	3 2 2 1	1 0 0 0
P2	2 1 1 1	1 1 0 0
P3	3 2 2 1	1 1 1 0

Is the system in a **safe state**? Justify using **Banker's Algorithm**.

4. Given the following access matrix:
 

User/File	File A	File B	File C
User 1	R,W	R	--
User 2	--	R, W	R
User 3	R	--	W

  - a) Can **User 2** delete File A?
  - b) Suggest how **access rights** can be changed to allow **User 1** to write to File C.
5. Design a hierarchical directory structure for a university campus server. Include security and access rules.

**5E1754**

Roll No. \_\_\_\_\_

[Total No. of Pages : 2]

**5E1754**

**B. Tech. V-Sem. (Main & Back) Examination,  
November/December - 2025  
Artificial Intelligence  
5CS4-04 Computer Graphics & Multimedia**

**Time : 3 Hours****Maximum Marks : 70****Instructions to Candidates:**

*Attempt all Ten questions from Part A, Five questions out of seven questions from Part B and Three questions out of five questions from Part C.*

*Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.*

*Use of following supporting material is permitted during examination.*

*(Mentioned in form No. 205).*

**PART - A**

**(Answer should be given up to 25 words only)**

**All questions are compulsory.**

**(10×2=20)**

1. Write four applications of computer graphics.
2. What is the difference between raster and random scan systems?
3. Name any four display devices used in computer graphics.
4. What is aliasing?
5. List the types of polygon filling algorithms.
6. What is the role of window-to-viewport transformation?
7. Differentiate between point clipping and line clipping.
8. What is the function of a viewing pipeline?
9. What is the purpose of dithering in image processing?
10. What is ray tracing in computer graphics?

**PART - B**

**(Analytical / Problem Solving Questions)**

**Attempt any Five questions.**

**(5×4=20)**

1. Explain the role of various Output Primitives Attributes in Computer Graphics.
2. Explain the difference between inside-outside and boundary-fill algorithms with examples.
3. Differentiate between perspective and parallel projection with appropriate diagrams.

**5E1754 / 435****(1)****[Contd....**

4. Describe the construction and features of B-spline curves.
5. Discuss any two illumination models used in graphics.
6. Compare raster animation and key frame animation techniques.
7. What is the fundamental principle of reflection and shearing in 2D transformations? Explain each with one example.

### PART - C

(Descriptive / Analytical / Problem Solving / Design Questions)

Attempt any Three questions.

(3×10=30)

(Each question has two sub-parts. (a) is of 7 marks and (b) is of 3 marks.)

1.
  - a) Discuss all types of 2D transformations with matrix formulas.
  - b) Perform a 2D translation of point (4, 5) by (3, -2). What is the new coordinate?
2.
  - a) Illustrate the process of clipping a polygon using the Sutherland-Hodgman algorithm.
  - b) Given a line from P1(2, 3) to P2(10, 6), apply Cohen-Sutherland Line Clipping for a window with  $X_{min} = 0$ ,  $X_{max} = 8$ ,  $Y_{min} = 2$ ,  $Y_{max} = 5$ . Show step-by-step region code assignment.
3.
  - a) Describe 3D geometric transformations: translation, rotation, and scaling with matrix operations.
  - b) Apply a 3D transformation that translates point P(1, 2, 3) by ( $T_x = 2$ ,  $T_y = 1$ ,  $T_z = 4$ ). What is the resulting point?
4.
  - a) Compare CMY, YIQ, and HSV colour models with diagrams.
  - b) Assume an RGB colour model. If  $R = 120$ ,  $G = 65$ ,  $B = 210$ , convert the colour to HSV(Hue, Saturation, Value) format.
5.
  - a) Write a detailed note on Koch and Dragon curves with diagrams.
  - b) Given two keyframes:  
Frame 1 at time  $t = 0$ : Position = (10, 20),  
Frame 2 at time  $t = 10$ : Position = (30, 40).  
Find the interpolated position at time  $t = 5$  using linear interpolation.

**5E1755**

Roll No. \_\_\_\_\_

[Total No. of Pages : 3]

**5E1755**

**B.Tech. V-Sem. (Main & Back) Examination, November/December - 2025**  
**Artificial Intelligence**  
**5CS4-05 Analysis of Algorithms**

**Time : 3 Hours****Maximum Marks : 70****Instructions to Candidates:**

*Attempt All Ten questions from Part A, Five questions out of seven questions from Part B and Three questions out of Five questions from Part C.*

*Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.*

*Use of following supporting material is permitted during examination.*

*(Mentioned in form No. 205).*

**PART - A**

**(Answer should be given up to 25 words only)**

**All questions are compulsory.**

**(10×2=20)**

1. What is the time complexity of Merge Sort and why?
2. Define Big-O notation with examples and graphs.
3. What is the basic idea of the Divide and Conquer method?
4. How does the Greedy method differ from Dynamic Programming?
5. What is the time complexity of the 0/1 Knapsack using DP?
6. What is the principle behind the Rabin-Karp algorithm?
7. What makes a problem NP-Complete?
8. State Cook's Theorem in brief.
9. Give one example each of Las Vegas and Monte Carlo algorithms.
10. What is the approximation ratio for the Vertex Cover problem using greedy algorithms?

**5E1755 / 435****(1)****[Contd....**

**PART - B**  
**(Analytical / Problem Solving Questions)**

**Attempt any Five questions.**

**(5×4=20)**

1. Trace the steps of Merge Sort on the array: [38, 27, 43, 3, 9, 82, 10].
2. Solve the 0/1 Knapsack problem with weights = [2, 3, 4, 5], Values = [3, 4, 5, 6], and capacity = 5 using dynamic programming.
3. Find the optimal job sequence for maximum profit from : Jobs = [(J1, 100, 2), (J2, 19, 1), (J3, 27, 2), (J4, 25, 1), (J5, 15, 3)]. For example in the tuple (J1, 100, 2): J1 is the job ID or name of the job. 100 is the profit associated with completing the job. 2 is the deadline by which the job must be completed (in time units).
4. Construct the prefix table (LPS array) for the KMP pattern ABABAC.
5. Demonstrate the NP-Completeness of the Vertex Cover problem through reduction from SAT or another NP-Complete problem.
6. Apply Strassen's algorithm to multiply the following 2×2 matrices:  
$$A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}, B = \begin{bmatrix} 5 & 6 \\ 7 & 8 \end{bmatrix}$$
7. Find the minimal spanning tree (MST) for the following weighted graph using Kruskal's algorithm: Vertices: {A, B, C, D, E} and Edges with weights: {(A-B, 1), (B-C, 3), (A-C, 2), (C-D, 4), (D-E, 5), (B-E, 6)}

**PART - C**  
**(Descriptive / Analytical / Problem Solving / Design Questions)**

**Attempt any Three questions.**

**(3×10=30)**

1. Design a hybrid sorting algorithm combining Merge Sort and Insertion Sort and analyze its time complexity.

2. Evaluate the suitability of Greedy vs Dynamic Programming approaches for solving the 0/1 Knapsack problem.
  3. Propose a randomized algorithm for prime number detection and classify it as Las Vegas or Monte Carlo.
  4. Evaluate the efficiency of different pattern matching algorithms for varying pattern lengths and repetitions.
  5. Construct a reduction from 3-SAT to Vertex Cover to demonstrate NP-Completeness.
-

**5E1756**

Roll No. \_\_\_\_\_

[Total No. of Pages : 3]

**5E1756**

**B.Tech. V-Sem. (Main&Back) Examination, November/December - 2025**  
**Artificial Intelligence**  
**5CS5-11 Wireless Communication**

**Time : 3 Hours****Maximum Marks : 70****Instructions to Candidates:**

*Attempt all Ten questions from Part A, Five questions out of seven questions from Part B and Three questions out of five questions from Part C.*

*Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.*

*Use of following supporting material is permitted during examination.*

*(Mentioned in form No. 205).*

**PART - A****(Answer should be given up to 25 words only)****All questions are compulsory.****(10×2=20)**

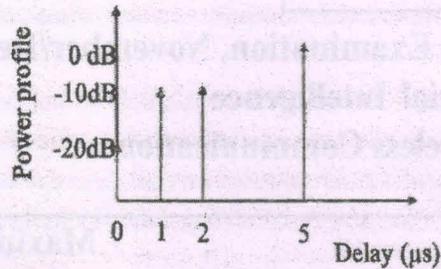
1. Explain the concept of frequency reuse ratio.
2. What is Doppler spread? How does it affect signal transmission?
3. What is the difference between narrowband and wideband channels?
4. Differentiate between fast fading and slow fading.
5. Define coherence bandwidth and its significance.
6. What is Offset-QPSK.
7. What is the purpose of an adaptive equalizer?
8. Define spatial multiplexing in MIMO systems.
9. Define PAPR in OFDM systems.
10. Write two differences between FDMA and TDMA.

**PART - B****(Analytical / Problem Solving Questions)****Attempt any Five questions.****(5×4=20)**

1. Describe the Fraunhofer region and provide the relevant mathematical expression.

**5E1756 / 435****(1)****[Contd....**

2. A complex baseband of transmitter operates at a 80 MHz frequency spectrum and its receive power delay profile is given below figure.



Find the following.

- RMS delay spread.
  - Average weighted delay.
  - Coherent Bandwidth.
3. Assume a path loss exponent of  $n = 4$  and consider trunking efficiency 30 W. A receiver is located 8 km from a transmitter. The carrier frequency is 1.9 GHz. Free space propagation is assumed  $G_t = 2$  and  $G_r = 1$ . Find
- The magnitude of the electric field at the receiver antenna.
  - The power at the mobile unit using two-ray ground reflected model when  $h_t = 40\text{m}$ ,  $h_r = 2\text{m}$  and ground reflection is  $-1$ .
4. Derive the probability density function (pdf) of  $y = x^2$ , where  $x$  is Rayleigh random variable whose pdf is  $f_x(x) = xe^{-\frac{x^2}{2}}$ .
5. A mobile communication system uses the Two-Ray Ground Reflection Model to model the signal propagation. The transmitter is at a height of 30 meters above the ground, and the receiver is at a height of 1.5 meters. The transmitted power is 50 W. The distance between the transmitter and receiver is 2km. The frequency of operation is 900 MHz. Compute the received signal strength in dBm.
6. Explain the principle of OFDM. Discuss how cyclic prefix and windowing improve performance in fading channels.
7. Describe handoff process. A mobile user is moving at a speed of 72km/h in a cellular network where the cell radius is 1km. If the user makes a call lasting 10 minutes, determine the expected number of handoffs during the call.

### PART - C

(Descriptive / Analytical / Problem Solving / Design Questions)

Attempt any Three questions.

(3×10=30)

- Explain the concept of multi-Antenna systems and compute the optimum weighting coefficients for multi antenna system employing maximum ratio combining scheme.
- Explain the Hata Model using suitable example and diagram. Also discuss its importance and role in the wireless communication.

3. Explain Fresnel zone with suitable diagram. A 6 GHz signal is transmitted over a distance of 8km. A tower at the midpoint has an obstacle at a height of 10m. Does the obstacle interfere with the first Fresnel zone?
4. A hexagonal cell within four cell system has a radius of 1.387km. A total of 60 channels are used within the entire system. If the load per user is 0.029 Erlangs and  $\lambda = 1$  call/hour. The system is designed with a 5% probability of delayed calls, and each cell experiences a traffic intensity of 15 Erlangs and 10 Erlangs for 15 channels per cell and 10 channels per cell, respectively. Compute the following.
  - a) How many users per square kilometer this system can support?
  - b) Probability (waiting time of delayed call  $> 10$  second)
  - c) Probability (call will be delayed  $> 10$  second)?
5. Write short notes (**any Two**)
  - a) Zero Forcing Scheme.
  - b) Rake Receiver.
  - c) DQPSK.

**5E1757**

Roll No. \_\_\_\_\_

[Total No. of Pages : 2]

**5E1757****B.Tech. V-Sem. (Main&Back) Examination, November/December - 2025****Artificial Intelligence  
5CS5-12 Human-Computer Interaction****Time : 3 Hours****Maximum Marks : 70****Instructions to Candidates:**

*Attempt All Ten questions from Part A, Five questions out of seven questions from Part B and Three questions out of five questions from Part C.*

*Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.*

*Use of following supporting material is permitted during examination.*

*(Mentioned in form No. 205)*

**PART - A****(Answer should be given up to 25 words only)****All questions are compulsory.****(10×2=20)**

1. What does a Petri Net represent in HCI?
2. Define Concur Task Tree.
3. Define usability in Human-Computer Interaction.
4. Why do we conduct experiments in interface testing?
5. List two types of Cognitive Architecture used in HCI.
6. What is the role of prototyping in HCI design?
7. Define MHP.
8. What is the goal of contextual inquiry?
9. List any two of Shneiderman's eight golden rules.
10. State Fitts's law and its significance in interface design.

**PART - B****(Analytical / Problem Solving Questions)****Attempt any Five questions.****(5×4=20)**

1. How do ergonomics affect the interaction between man and machine? Explain.

2. Explain the design process in detail and also explain the difference between local structure and global structure.
3. Describe Nielsen's ten heuristics with example of its use heuristics evaluation.
4. Write short note on:
  - a) OOP introduction.
  - b) GUI design and Aesthetics.
5. Explain Empirical Research methods for Human-Computer Interaction with suitable example.
6. What is OOM? Explain the types of model with their purpose in detail.
7. Describe how heuristic evaluation helps in improving an app's interface.

### **PART - C**

**(Descriptive / Analytical / Problem Solving / Design Questions)**

**Attempt any Three questions.**

**(3×10=30)**

1. Describe the historical evolution of HCI and discuss how it influences modern software and GUI design.
2. Compare and evaluate KLM and CMN-GOMS models using a real-world example of filling a contact form.
3. Create a complete Hierarchical Task Analysis (HTA) and FSM model for an ATM cash withdrawal system.
4. Explain the steps in designing an empirical study using one-way ANOVA to compare user satisfaction across three e-learning platforms.
5. Explain
  - a) Hick Hyman Law.
  - b) Cognitive Walkthrough.

**5E1821**

Roll No. \_\_\_\_\_

[Total No. of Pages : 2]

**5E1821****B.Tech. V-Sem. (Main&Back) Examination, November/December - 2025****Artificial Intelligence and Data Science****5AID3-01 Data Mining-Concepts and Techniques****AID, CAI, CDS****Time : 3 Hours****Maximum Marks : 70****Instructions to Candidates:**

*Attempt all Ten questions from Part A, Five questions out of seven questions from Part B and Three questions out of five questions from Part C.*

*Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.*

*Use of following supporting material is permitted during examination.*

*(Mentioned in form No. 205).*

**PART - A****(Answer should be given up to 25 words only)****All questions are Compulsory.****(10×2=20)**

1. What is data mining?
2. Name two key functionalities of data mining.
3. List the main steps of the data mining process.
4. Define data preprocessing.
5. What is classification in predictive modeling?
6. What is clustering in descriptive modeling?
7. Mention two advantages of the FP-Growth algorithm over Apriori.
8. What is web mining?
9. Define outlier analysis.
10. Name two social issues related to data mining.

**PART - B****(Analytical/Problem Solving Questions)****Attempt any Five questions.****(5×4=20)**

1. Explain the steps in the data mining process with a suitable diagram.
2. Classify data mining systems with examples.

3. Discuss major issues encountered in data mining.
4. Describe data preprocessing techniques: data cleaning, transformation, and discretization.
5. Explain decision tree induction with a simple example.
6. Write a note on Bayes classification methods.
7. Describe Support Vector Machines (SVMs).

### PART - C

(Descriptive/Analytical/Problem Solving/Design Question)

**Attempt any Three questions.**

**(3×10=30)**

1. Compare partitioning vs. hierarchical clustering methods.
  2. Describe probabilistic model-based clustering and its applications.
  3. Explain the FP-Growth algorithm in frequent pattern mining with an example.
  4. Discuss mining in multilevel and multidimensional pattern spaces.
  5. Explain real-world applications of web, temporal, and spatial mining.
-

**5E1826**

Roll No. \_\_\_\_\_

[Total No. of Pages : 2]

**5E1826****B.Tech. V-Sem. (Main&Back) Examination, November/December - 2025****Artificial Intelligence and Data Science****5AID5-11 Fundamental of Block Chain (Elective-I)****AID,CAI,CDS****Time : 3 Hours****Maximum Marks : 70****Instructions to Candidates:**

*Attempt all Ten questions from Part A, Five questions out of seven questions from Part B and Three questions out of five questions from Part C.*

*Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.*

*Use of following supporting material is permitted during examination.*

*(Mentioned in form No. 205).*

**PART - A****(Answer should be given up to 25 words only)****All questions are compulsory.****(10×2=20)**

1. Define the double-spend problem in blockchain.
2. What is public key cryptography?
3. State two advantages of using blockchain technology.
4. What is the purpose of hashing in blockchain?
5. Define distributed consensus.
6. Write any two features of the bitcoin blockchain.
7. What are smart contracts in ethereum?
8. Differentiate between public and private blockchain.
9. What is proof of work?
10. Give one use case of block chain in supply chain management.

**PART - B****(Analytical / Problem Solving Questions)****Attempt any Five questions.****(5×4=20)**

1. Explain the Byzantine generals problem with an example.
2. Describe the structure of a blockchain block with a diagram.

**5E1826 / 435****(1)****[Contd....**

3. Differentiate between block chain 1.0, 2.0 and 3.0 with examples.
4. Explain how hashing ensures data integrity in blockchain systems.
5. What are the main operations performed in the ethereum blockchain?
6. Discuss Federated byzantine consensus in blockchain systems.
7. What is the role of incentive models in blockchain networks?

### PART - C

(Descriptive / Analytical / Problem Solving / Design Questions)

Attempt any Three questions.

(3×10=30)

1. Explain in detail the bitcoin blockchain, including its structure, operations, features and consensus model.
2. Illustrate the Ethereum blockchain architecture and explain the working of smart contracts with example.
3. What are consensus algorithms? Explain proof of state and proof of work in detail with advantages and limitations.
4. Discuss different types of blockchain networks, public, private, semi-private and sidechain with appropriate example.
5. Describe blockchain use case in supply chain management, highlighting its benefits and implementation challenges.

**5E1827**

Roll No. \_\_\_\_\_

[Total No. of Pages : 3]

**5E1827****B.Tech. V-Sem. (Main & Back) Examination, November/December - 2025****Artificial Intelligence and Data Science****5AID5-12 Probability and Statistics for Data Science (Elective-II)****AID,CDS****Time : 3 Hours****Maximum Marks : 70****Instructions to Candidates:**

*Attempt all Ten questions from Part A, Five questions out of seven questions from Part B and Three questions out of five questions from Part C.*

*Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.*

*Use of following supporting material is permitted during examination.*

*(Mentioned in form No. 205).*

**PART - A****(Answer should be given up to 25 words only)****All questions are compulsory.****(10×2=20)**

1. Define mean and weighted mean. How are they different?
2. What does a box plot represent in descriptive statistics?
3. If mean of Poisson distribution is 3, then what is the value of variance?
4. What is the Central Limit Theorem and why is it important?
5. Define null hypothesis and alternative hypothesis.
6. What is the formula for the chi-square statistic?
7. If  $y = 2x + 10$  is the best fit for 5 pairs of values  $(x, y)$ , by least square method, and  $\sum y = 200$ ; then what is the value of  $\sum x$ ?
8. If the correlation coefficient  $r = 0.6$  and the regression coefficient of X on Y,  $b_{xy} = 0.24$ , then find the value of  $b_{yx}$ .
9. What is the primary purpose of logistic regression?
10. What are the major differences between ANOVA and MANOVA techniques in statistical analysis?

**PART - B**

**(Analytical / Problem Solving Questions)**

**Attempt any Five questions.**

**(5×4=20)**

1. Find the average deviation about medians for the following distribution:

$x$	6	12	18	24	30	36	42
$f$	4	7	9	18	15	10	5

2. A factory produces an item using three machines A, B, and C which account for 20%, 30%, and 50% of its output, respectively. Of the items produced by machine A, 5% are defective; similarly, 3% of machine B's items and 1% of machine C's are defective. If a randomly selected item is defective, what is the probability it was produced by machine C?
3. The diameter of an electric cable X is a continuous random variable with

$$f(X) = \begin{cases} kx^2; & 0 \leq x \leq 3 \\ 0; & \text{otherwise} \end{cases}$$

Then find the value of k and compute  $P(1 < X < 2)$ .

4. A study measures the heights of men from two different cities. Two samples of size 800 and 1200 have mean heights of 172.4 cm and 171.8 cm, respectively. Assuming a standard deviation of 6 cm for the population, test at 5% level whether the two samples can be considered from the same population.
5. In a sample of 1000 people in Rajasthan, 540 are rice eaters and the rest are wheat eaters. Can we assume that both rice and wheat are equally popular in the state at 1% level of significance?
6. Given the following data on advertising expenditure (X) and sales (Y):
- |           |    |    |    |    |    |
|-----------|----|----|----|----|----|
| <b>X:</b> | 10 | 20 | 30 | 40 | 50 |
| <b>Y:</b> | 25 | 45 | 65 | 70 | 95 |
- Fit a simple linear regression model of Y on X. Hence, estimate sales when advertising expenditure is Rs. 35,000.
7. Discuss the concepts of ridge regression and lasso regression and their importance in statistical modeling.

**PART - C**

**(Descriptive / Analytical / Problem Solving / Design Questions)**

**Attempt any Three questions.**

**(3×10=30)**

1. Compute the mean, median, mode, range, and standard deviation for the following data:

X: 5, 7, 9, 10, 13, 15, 18, 20, 25.

Comment on the skewness of the distribution.

2. a) Derive moment generating function for Binomial distribution.  
b) If X is uniformly distributed with mean 1 and variance 4/3, then estimate  $P(X < 0)$ .

3. Find the Student's  $t$  for following variable values in a sample of eight:

-4, -2, -2, 0, 2, 2, 3, 3.

Taking the mean of the universe to be zero.

4. Apply the least squares method to obtain the parabolic (second-degree) regression equation for the following data:

$x$	1	2	3	4	5
$y$	1090	1220	1390	1625	1915

5. Perform a one-way ANOVA for the following groups and test if their means are equal at 5% level:

Group A: 8, 9, 6, 7

Group B: 10, 11, 9, 8.

Group C: 12, 13, 11, 10.

**5E1788**

Roll No. \_\_\_\_\_

[Total No. of Pages : 2]

**5E1788**

**B.Tech. V-Sem. (Main&Back) Examination, November/December - 2025**  
**Information Technology**  
**5IT3-01 Microprocessor and Interfaces**

**Time : 3 Hours****Maximum Marks : 70****Instructions to Candidates:**

*Attempt all Ten questions from Part A, Five questions out of seven questions from Part B and Three questions out of five questions from Part C.*

*Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.*

*Use of following supporting material is permitted during examination.  
(Mentioned in form No. 205).*

**PART - A****(Answer should be given up to 25 words only)****All questions are compulsory.****(10×2=20)**

1. What is the function of Demultiplexing in 8085 bus architecture?
2. Which interrupt has highest priority in 8085? What is the priority of other interrupts?
3. Write one use of Program peripheral interface 8255A.
4. What is the difference between instruction cycle and machine cycle?
5. What is HOLD and HLDA? How it is used?
6. Define stack pointer and program counter.
7. How the 8085 processor differentiates memory access (read/write) and IO access (read/write)?
8. Define opcode and operand?
9. What are the functions performed by data transfer instructions? Give an example and explain.
10. What does the instruction MVI A,5DH achieve?

## PART - B

### (Analytical / Problem Solving Questions)

Attempt any Five questions.

(5×4=20)

1. Explain different type of addressing modes in 8085 with one example.
2. Write an assembly language program to subtract two 8-bit numbers.
3. With a block diagram, explain how ALU, registers and control units interact in 8085 executions.
4. Write short notes on status flag register. Also write down condition under which the flag bits affected.
5. Discuss the difference between CALL and RST instructions with example.
6. Explain the operating modes of 8255A programmable peripheral interface.
7. Compare maskable and non-maskable interrupts in 8085.

## PART - C

### (Descriptive / Analytical / Problem Solving / Design Questions)

Attempt any Three questions.

(3×10=30)

1. Discuss in detail the architecture and operation of programmable interrupt controller 8259A.
2. Write an assembly language program to find the largest number from an array of 20 numbers.
3. Explain the complete architecture of 8085 microprocessor with neat block diagram.
4.
  - a) Differentiate between hardware and software interrupts in 8085 with example.
  - b) Write a short assembly language program to move data from one memory location to another.
5.
  - a) Differentiate Microprocessor with Microcontroller.
  - b) Explain the role of accumulator in arithmetic and logic operation.

**5E1789**

Roll No. \_\_\_\_\_

[Total No. of Pages : 2]

**5E1789**

**B.Tech. V-Sem. (Main & Back) Examination, November/December - 2025**  
**Information Technology**  
**5IT5-12 Software Testing and Project Management (Elective - I)**

**Time : 3 Hours****Maximum Marks : 70****Instructions to Candidates:**

*Attempt all Ten questions from Part A, Five questions out of Seven questions from Part B and Three questions out of Five questions from Part C.*

*Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.*

*Use of following supporting material is permitted during examination.*

*(Mentioned in form No. 205).*

**PART - A****(Answer should be given up to 25 words only)****All questions are Compulsory.****(10×2=20)**

1. What are project management competencies?
2. Explain estimation techniques?
3. What is the difference between Planning and Feasibility study?
4. Define regression testing with an example.
5. Explain the concept of cost monitoring in project management.
6. What is branch coverage in software testing?
7. What are the key issues involved in object-oriented testing?
8. Define software quality. What factors affect it?
9. What is risk management in software projects?
10. Define GUI testing. Why is it important?

## **PART - B**

### **(Analytical / Problem Solving Questions)**

**Attempt any Five questions.**

**(5×4=20)**

1. Explain the different types of plans to be considered during software project planning.
2. Describe Test case generation using UML diagrams.
3. Explain Object Oriented Testing? Describe scenario based Test design.
4. Explain the responsibilities of Software Project Manager?
5. Describe McCabe's Cyclomatic Complexity. How is it used in software testing?
6. Elaborate on the Decision table based Testing.
7. What are the main objectives of Project planning, and how can they be achieved?

## **PART - C**

### **(Descriptive/Analytical/Problem Solving/Design Questions)**

**Attempt any Three questions.**

**(3×10=30)**

1. How does surface structure testing differ from deep structure testing in object-oriented testing? Explain with examples.
2. Describe reactive and proactive strategies in detail. How do they differ in software project management?
3. Discuss the main steps involved in the project reviewing process.
4. Briefly explain software project estimation and its importance in project planning.
5. Write short note on : **(Any Three)**
  - a) Equivalence Class Testing
  - b) Software Process Model
  - c) Performance Testing
  - d) Error seeding

**5E1400**

Roll No. \_\_\_\_\_

[Total No. of Pages : 2]

**5E1400**

**B.Tech. V-Sem. (Re Back) Examination, December - 2025**  
**PCC/PEC Information Technology**  
**5IT5-12 Software Testing and Project Management**

**Time : 2 Hours****Maximum Marks : 80****Min. Passing Marks : 28****Instructions to Candidates:**

*Attempt all Five questions from Part A, Four questions out of Six questions from Part B and Two questions out of Three questions from Part C.*

*Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.*

*Use of following supporting material is permitted during examination.*

*(Mentioned in form No. 205).*

**PART - A****(Answer should be given up to 25 words only)****All questions are Compulsory.****(5×2=10)**

1. Define software project management.
2. Differentiate between black box and white box testing.
3. Explain the term "Regression Testing".
4. What is the importance of effort estimation in project management?
5. What is the purpose of UML in test case generation?

**PART - B****(Analytical / Problem Solving Questions)****Attempt any Four questions.****(4×10=40)**

1. Discuss the various software process models used in project management.
2. Explain boundary value and equivalence class testing with suitable examples.
3. Describe the responsibilities of a software project manager.
4. Write short notes on:
  - a) Mutation Testing
  - b) Error Seeding
5. Explain integration testing and system testing with examples.
6. Describe how test cases are designed using object-oriented software.

**PART - C**

**(Descriptive / Analytical / Problem Solving / Design Questions)**

**Attempt any Two questions.**

**(2×15=30)**

1. How do object-oriented testing methods differ from conventional testing? Discuss with examples.
2. Design a UML-based test case generation for a login module in software.
3. Explain scenario-based test design and its relevance to software project management.

**5E1352**

Roll No. \_\_\_\_\_

[Total No. of Pages : 2]

**5E1352****B.Tech. V-Sem. (Re Back) Examination, November/December - 2025****Computer Sc. & Engg.  
5CS4-02 Compiler Design  
CS, IT****Time : 3 Hours****Maximum Marks : 120****Min. Passing Marks:42*****Instructions to Candidates:***

*Attempt all Ten questions from Part A, Five questions out of seven questions from Part B and Four questions out of five questions from Part C.*

*Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.*

*Use of following supporting material is permitted during examination.*

*(Mentioned in form No. 205).*

**PART - A****(Answer should be given up to 25 words only)****All questions are Compulsory.****(10×2=20)**

1. What is bootstrapping in compiler design?
2. What is Lexical Analyzer?
3. What is the main difference between top-down and bottom-up parsing?
4. What is an ambiguous grammar?
5. What is symbol table in a compiler?
6. What is loop invariant code motion in optimization?
7. What is an activation record?
8. Explain left factoring.
9. What is parameter passing.
10. Write difference between compiler and interpreter.

## PART - B

(Analytical / Problem Solving Questions)

Attempt any Five questions.

(5×8=40)

1. What is compiler? Explain different phases of compiler.
2. Explain various code optimization techniques. How is DAG used in code optimization and generation?
3. What is the role of parsing? Explain types of parsing in compiler design.
4. Explain LR parsing algorithm with example.
5. Define unambiguous grammar. Show that given grammar is ambiguous. Also, find an equivalent unambiguous grammar.  $E \rightarrow E + E$ ,  $E \rightarrow E * E$  and  $E \rightarrow id$ .
6. Explain S-attributed definition and L-attributed definitions.
7. Explain three techniques for loop optimization with example.

## PART - C

(Descriptive / Analytical / Problem Solving / Design Questions)

Attempt any Four questions.

(4×15=60)

1. Write different intermediate code representations postfix notation, three-address code, DAG, and their use in syntax-directed translation.
2. Show the following grammar:  $S \rightarrow Aa|bAc|Bc|bBa$

$A \rightarrow d$

$B \rightarrow d$

Is LR(1) but not LALR(1).

3. Eliminate Left recursion from following grammar.  $S \rightarrow (L)X$ ,  $L \rightarrow L$ ,  $S|S$ .
4. Explain Peephole optimization also explain Syntax directed Translation with an example.
5. Write short notes on:
  - a) YACC
  - b) Rules for closure operation and Goto operation
  - c) Augmented Grammar
  - d) Dependency graph
  - e) Inherited Attributes

**5E1354**

Roll No. \_\_\_\_\_

[Total No. of Pages : 2]

**5E1354****B.Tech. V-Sem. (Re Back) Examination, November/December - 2025****Computer Sc. & Engg.****5CS4-04 Computer Graphics & Multimedia****CS,IT****Time : 3 Hours****Maximum Marks : 120****Min. Passing Marks:42****Instructions to Candidates:**

*Attempt all Ten questions from Part A, Five questions out of seven questions from Part B and Four questions out of five questions from Part C.*

*Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.*

*Use of following supporting material is permitted during examination.*

*(Mentioned in form No. 205).*

**PART - A****(Answer should be given up to 25 words only)****All questions are Compulsory.****(10×2=20)**

1. Define computer graphics. List two of its common applications.
2. Differentiate between raster scan and random scan displays.
3. Write two advantages of using homogeneous coordinates in geometric transformations.
4. List any Four graphics input or output devices.
5. What is aliasing? How can it be reduced?
6. Write the basic steps of the DDA line drawing algorithm.
7. What do you understand by polygon clipping?
8. State any two illumination models used in computer graphics.
9. Name any two color models and their primary components.
10. What is key-frame animation?

## PART - B

### (Analytical / Problem Solving Questions)

Attempt any Five questions. (5×8=40)

1. Explain the architecture of a computer graphics system with a neat block diagram.
2. Draw a line using Bresenham's algorithm for the endpoints (2,3) and (10,7). Show all intermediate steps.
3. Derive and explain the composite 2D transformation matrix for rotation followed by translation.
4. Explain the Cohen-Sutherland line clipping algorithm with a suitable example.
5. Describe the difference between parallel and perspective projections. Illustrate with a diagram.
6. Explain the Phong illumination model and compare it with Gouraud shading.
7. Write short notes on the following.
  - a) JPEG image compression
  - b) MPEG video compression

## PART - C

### (Descriptive / Analytical / Problem Solving / Design Questions)

Attempt any Four questions. (4×15=60)

1.
  - a) Explain in detail various display technologies used in computer graphics.
  - b) Discuss advantages of raster displays over vector displays. (8+7=15)
2.
  - a) Explain and illustrate 2D geometric transformation: translation, rotation, scaling, reflection, and shearing.
  - b) Show with an example how multiple transformations can be combined into a single matrix. (10+5=15)
3.
  - a) Explain the 3D viewing pipeline in detail with a neat diagram.
  - b) A 3D object has coordinates (2,4,6). Apply a scaling of 2 along x, 0.5 along y, and 1 along z, followed by a translation of (-1,2,3). Find its new coordinates. (10+5=15)
4.
  - a) Explain surface rendering methods and visibility algorithms.
  - b) Discuss texture mapping and its importance in realistic graphics. (9+6=15)
5.
  - a) What are the fundamental principles of animation? Explain the steps in designing a motion sequence.
  - b) Write short notes on fractals and ray tracing used for realism in computer graphics. (9+6=15)

**5E1355**

Roll No. \_\_\_\_\_

[Total No. of Pages : 2]

**5E1355****B.Tech. V-Sem. (Re Back) Examination, December - 2025****Computer Sc. and Engg.****5CS4-05 Analysis of Algorithms****CS, IT****Time : 3 Hours****Maximum Marks : 120****Min. Passing Marks:42*****Instructions to Candidates:***

*Attempt all Ten questions from Part A, Five questions out of seven questions from Part B and Four questions out of five questions from Part C.*

*Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.*

*Use of following supporting material is permitted during examination.*

*(Mentioned in form No. 205).*

**PART - A****(Answer should be given up to 25 words only)****All questions are Compulsory.****(10×2=20)**

1. Define Big-O, Big- $\Omega$  and Big- $\Theta$  notations and state their relationship.
2. State the recurrence and time complexity of Merge Sort.
3. What is the key idea behind divide and Conquer? Give one example.
4. Define greedy-choice property and optimal substructure with one-line examples.-
5. State the dynamic programming approach for Matrix Chain Multiplication.
6. Give the lower bound argument for comparison-based sorting.
7. Briefly define Branch-and-Bound and its typical use for TSP.
8. Define the rolling hash idea used in Rabin-Karp algorithm.
9. State definitions of P, NP, NP-Complete and NP-Hard.
10. What is approximation ratio for an approximation algorithm?

## PART - B

### (Analytical / Problem Solving Questions)

Attempt any Five questions.

(5×8=40)

1. Given  $T(n)=3T(n/2)+n$ ,  $T(1)=1$ . Use Master Theorem to find tight asymptotic bound. Show intermediate steps.
2. Given array  $A=[38,27,43,3,9,82,10]$ , show the full Merge sort recursion tree, write the recurrence solved at each level and compute number of comparisons in the worst case.
3. Write Kruskal's algorithm to find MST. Explain with the help of example.
4. Find the length and one LCS for strings  $X="AGGTAB"$  and  $Y="GXTXAYB"$ . Show DP table construction and backtracking path.
5. Explain Traveling Salesman Problem with the help of example.
6. Construct the prefix (lps) table for pattern  $P="ABABAC"$  and demonstrate KMP search steps on text  $T="ABABABCABABAC"$ . Mark indices of matches.
7. Explain the randomized contraction algorithm for global min-cut and compute probability that a specific min-cut is returned by a single run on a graph with  $n$  vertices.

## PART - C

### (Descriptive / Analytical / Problem Solving / Design Questions)

Attempt any Four questions.

(4×15=60)

1. Derive the recurrence for Strassen's matrix multiplication and solve for its time complexity. Compare it with classical  $O(n^3)$  multiplication and state crossover benefits and draw backs (assume  $n$  is power of 2).
2. Given items: weights = [2,3,4,5], values = [3,4,5,6], capacity  $W = 5$ . solve 0/1 knapsack with DP (show table) and fractional knapsack with greedy (show chosen fractions).
3. Using backtracking, show how N-Queens ( $N = 8$ ) search prunes using column and diagonal constraints: estimate worst-case backtracking node count expression (qualitatively) and suggest two strong pruning heuristics.
4. a) State Cook's theorem and explain the significance of polynomial-time reductions in proving NP-Completeness.  
b) Show a polynomial-time reduction from 3-SAT to Vertex Cover (outline main construction and argue correctness).
5. Describe Monte Carlo vs Las Vegas randomized algorithms. Give one example of each from syllabus and state their error or runtime guarantees.

Roll No. \_\_\_\_\_

[Total No. of Pages : 2]

5E1399

5E1399

B.Tech. V-Sem. (Re Back) Examination, November/December - 2025

ESC Information Technology

5IT3-01 Microprocessor And Interfaces

Time : 2 Hours

Maximum Marks : 80

Min. Passing Marks : 28

**Instructions to Candidates:**

*Attempt all Five questions from Part A, Four questions out of six questions from Part B and two questions out of three questions from Part C.*

*Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.*

*Use of following supporting material is permitted during examination.*

*(Mentioned in form No. 205).*

**PART - A**

**(Answer should be given up to 25 words only)**

**All questions are Compulsory.**

**(5×2=10)**

1. Explain T-states.
2. Give the name of interrupts in 8085.
3. Explain Microprocessor.
4. Define ALU.
5. Explain demultiplexing.

**PART - B**

**(Analytical / Problem Solving Questions)**

**Attempt any Four questions.**

**(4×10=40)**

1. Write an assembly language programme two add two 8-bit numbers.
2. What is the instruction format. Discuss different types of instruction formats?
3. Explain control words of 8259.
4. Briefly explain RST instructions.

5. Compare CALL and PUSH instruction.
6. What is subroutine? Explain briefly.

**PART - C**

**(Descriptive / Analytical / Problem Solving / Design Questions)**

**Attempt any Two questions.**

**(2×15=30)**

1. Draw and explain the block diagram of 8255 PPI.
  2. Draw the architecture of 8085 microprocessor and discuss each part of it.
  3. Compare the following instruction pairs.
    - a) JMP and CALL
    - b) STAX and LDAX
    - c) LXI and LHLD
    - d) ANI and ANA
    - e) CALL and PUSH
-