

(6 pages)

Reg. No. :

Code No. : 20862 E Sub. Code : FSCS 21

B.Sc. (CBCS) DEGREE EXAMINATION, APRIL 2025.

Second Semester

Computer Science

Skill Enhancement Course – COMPUTER
ARCHITECTURE

(For those who joined in July 2024 onwards)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. What are the main components of basic computer system?
(a) CPU, RAM, Hard Disk
(b) Control Unit, ALU, Memory, Input/Output
(c) Register, ALU, Mouse, Keyboard
(d) Cache, ROM, Control Unit

2. The steps involved in instruction cycle are _____
(a) Fetch, Decode, Execute, Store
(b) Execute, Decode, Fetch, Store
(c) Decode, Store, Fetch, Execute
(d) Fetch, Store, Decode, Execute
3. The speed of a CPU is measured by _____
(a) Megabytes (b) Terabytes
(c) Gigahertz (GHz) (d) Bits per second
4. How many types of instruction formats are commonly used?
(a) 1 (b) 2
(c) 3 (d) 4
5. Which hardware component is used for binary multiplication?
(a) Half Adder (b) ALU
(c) Shift Register (d) Multiplexer
6. The result of adding 1101 and 1011 in binary is
(a) 11000 (b) 10101
(c) 10010 (d) 11111

7. Booth's algorithm is used for
- (a) Binary addition
 - (b) Floating-point division
 - (c) Multiplication of signed numbers
 - (d) Parallel processing
8. The DMA controller communicates with
- (a) CPU and memory
 - (b) Cache memory
 - (c) Hard disk only
 - (d) Monitor
9. Which memory is at the top of memory hierarchy?
- (a) Hard disk
 - (b) RAM
 - (c) Cache memory
 - (d) Register
10. The two main types of RAM are
- (a) SRAM and DRAM
 - (b) ROM and PROM
 - (c) Static RAM and Flash memory
 - (d) Cache and Virtual memory

PART B — ($5 \times 5 = 25$ marks)

Answer ALL questions, choosing either (a) or (b).
Each answer should not exceed 250 words.

11. (a) Define computer architecture and explain its basic components.
- Or
- (b) Discuss the different types of computer instructions with examples.
12. (a) Explain the role of Central Processing Unit (CPU) in computers.
- Or
- (b) Differentiate data manipulation and data transfer instructions.
13. (a) Explain the hardware implementation of binary addition.
- Or
- (b) Examine the concept of signed and unsigned number representation in computer arithmetic.
14. (a) Describe the steps involved in Booth's multiplication algorithm with example.
- Or
- (b) Discuss about floating-point arithmetic.

15. (a) Elucidate the concept of memory hierarchy with a neat diagram.

Or

- (b) Write a note on associative memory.

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 600 words.

16. (a) Explain the common bus organization with neat diagram.

Or

- (b) Discuss about instruction cycle with flow chart.

17. (a) Discuss the different instruction formats and their significance in CPU operations.

Or

- (b) Summarize the general register organization and its importance in instruction execution.

18. (a) Explain the division algorithm in detail.

Or

- (b) Explain the multiplication algorithm in detail.

19. (a) Classify the different types of I/O interfaces and their working principles.

Or

- (b) Elaborate on working of Direct Memory Access with neat diagram.

20. (a) Describe the structure and working of main memory in computer system.

Or

- (b) What is auxiliary memory? Explain the different types of auxiliary storage devices.
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Code No. : 20861 E Sub. Code : FECS 21

B.Sc. (CBSC) DEGREE EXAMINATION, APRIL 2025.

Second Semester

Computer Science

Elective – DISCRETE MATHEMATICS

(For those who joined in July 2024 onwards)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. A _____ is an ordered collection of objects
(a) Relation (b) Function
(c) Set (d) Proposition
2. What is the cardinality of the set of odd positive integers less than 10?
(a) 10 (b) 5
(c) 3 (d) 20

3. A function $f : R \rightarrow R$ defined as $f(x) = x^2$ is
(a) One-One (b) Many-One
(c) Onto (d) None of these
4. Let $A = \{1, 2, 3, 4, 5\}$ and R be a relation from A to A , $R = \{(x, y) : y = x + 1\}$. Find the domain
(a) $\{1, 2, 3, 4, 5\}$ (b) $\{2, 3, 4, 5\}$
(c) $\{1, 2, 3, 4\}$ (d) $\{1, 2, 3, 4, 5, 6\}$
5. The proposition $\sim(\sim P \rightarrow \sim Q)$ is equivalent to
(a) $\sim P \vee Q$ (b) $P \vee \sim Q$
(c) $P \wedge Q$ (d) $\sim P \wedge Q$
6. The compound propositions p and q are called logically equivalent if _____ is a tautology
(a) $p \leftrightarrow q$ (b) $p \rightarrow q$
(c) $\neg(p \vee q)$ (d) $\neg p \vee \neg q$
7. The determinant of identity matrix is?
(a) 1
(b) 0
(c) Depends on the matrix
(d) Unknown

8. A symmetric matrix is a one in which?
- All diagonal elements are zero
 - All diagonal elements are 1
 - $A = AT$
 - $A = -AT$
9. If A is an invertible square matrix then ———
- $(AT)^{-1} = (A^{-1})T$
 - $(AT)T = (A^{-1})T$
 - $(AT)^{-1} = (A^{-1})^{-1}$
 - unpredictable
10. Which of the following is not the property of transpose of a matrix?
- $(A')' = A$
 - $(A + B)' = A' + B'$
 - $(AB)' = (BA)'$
 - $(KA)' = KA'$

PART B — ($5 \times 5 = 25$ marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 250 words.

11. (a) If $A = \{1, 4\}$, $B = \{2, 3, 6\}$, $C = \{2, 3, 7\}$ then verify that $A \times (B - C) = (A \times B) - (A \times C)$.

Or

- (b) Using Venn diagrams, verify the following identities $A = (A \cap B) \cup (A - B)$. If A and B are finite sets, we have $|A \cup B| = |A| + |B| - |A \cap B|$.

12. (a) What do you mean by composition of functions? Let $f: R \rightarrow R$ defined as $f(x) = 4x + 3$ and $g: R \rightarrow R$ defined as $g(x) = x/3$. Find $f \circ g(x)$.

Or

- (b) Describe the relations on sets.

13. (a) Define disjunctive and conjunctive normal forms.

Or

- (b) Show that $S \vee R$ is a tautologically implied by $(P \vee Q) \wedge (P \rightarrow R) \wedge (Q \rightarrow S)$.

14. (a) If $A = \begin{bmatrix} 2 & 3 \\ 1 & 4 \end{bmatrix}$ and $B = \begin{bmatrix} 5 & 1 \\ 0 & 3 \end{bmatrix}$, find AB and BA . Is $AB = BA$?

Or

- (b) If $B = \begin{bmatrix} 1 & 0 \\ 4 & 7 \end{bmatrix}$, find $2B$ and $-3B$.

15. (a) Calculate the adjoint of the matrix

$$A = \begin{bmatrix} 1 & -1 & 2 \\ 2 & 3 & 5 \\ 1 & 0 & 3 \end{bmatrix}.$$

Or

- (b) Explain the properties of Adjoin matrix.

PART C — ($5 \times 8 = 40$ marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 600 words.

16. (a) Prove the following set identities

(i) $A - (B \cup C) = (A - B) \cap (A - C)$

(ii) $(A \cup B) = A \cap B$.

Or

- (b) Let A, B, C be three sets as shown in the following Venn diagram. For each of the following sets, draw a Venn diagram and shade the area representing the given set.

(i) $A \cup (B \cup C)$

(ii) $A \cap B \cap C$

(iii) $A \cup (B \cap C)$

(iv) $A - (B \cap C)$

(v) $A \cup (B \cap C)^c$

17. (a) Define equivalence relation with the help of suitable example.

Or

- (b) Let A be a given finite sets and $P(A)$ its power set. Let $\subseteq$ be the inclusion relation on the elements of $P(A)$. Draw the Hass diagram of $(P(A), \subseteq)$ for

(i) $A = \{a\}$

(ii) $A = \{a, b\}$

(iii) $A = \{a, b, c\}$

(iv) $A = \{a, b, c, d\}$.

18. (a) Construct the truth table $(P \vee Q) \rightarrow (P \wedge Q)$.

Or

(b) (i) Obtain the disjunctive normal form $P \rightarrow ((P \rightarrow Q) \wedge \neg(\neg Q \vee \neg P))$.

(ii) Obtain the principle conjunctive normal form $(\neg P \rightarrow R) \wedge (Q \leftrightarrow P)$.

19. (a) Find the transpose of $\begin{bmatrix} 5 & 6 & -7 & 5 & 0 \\ 4 & 3 & 0 & 1 & 2 \\ -6 & 2 & 1 & -3 & -4 \end{bmatrix}$.

Or

(b) Find the inverse of the following matrices and verify that $AA^{-1} = I$.

(i) $\begin{bmatrix} 2 & 1 & -1 \\ 1 & 0 & -1 \\ 1 & 1 & 2 \end{bmatrix}$.

(ii) $\begin{bmatrix} 6 & 3 \\ 4 & 5 \end{bmatrix}$.

20. (a) If $A = \begin{bmatrix} -5 & 1 & 3 \\ 7 & 1 & -5 \\ 1 & -1 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 1 & 2 \\ 3 & 2 & 1 \\ 2 & 1 & 3 \end{bmatrix}$, find the products AB and BA and hence solve the system of equations $x + y + 2z = 1$, $3x + 2y + z = 7$, $2x + y + 3z = 2$.

Or

(b) Discuss about singular and non-singular matrices.

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Reg. No. :

Code No. : 20859 E Sub. Code : FCCS 21

B.Sc. (CBCS) DEGREE EXAMINATION, APRIL 2025.

Second Semester

Computer Science – Core

DATA STRUCTURES AND ALGORITHMS

(For those who joined in July 2024 onwards)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. _____ is collection of facts, Concept and Figures.

- | | |
|------------|-----------------|
| (a) Data | (b) Information |
| (c) Record | (d) Data Type |

2. A _____ is a linked list in which each node has three fields namely Data, Next, Prev.

- | | |
|------------------------|------------------------|
| (a) List | (b) Array |
| (c) Singly Linked List | (d) Double Linked List |

3. _____ is a Linear Data Structure that follows Last In First Out (LIFO) principle.

- | | |
|------------------|-----------|
| (a) Stack | (b) Queue |
| (c) Linked Queue | (d) Array |

4. _____ Expression is the arithmetic operator appears between the two operands to which it is being applied.

- | | |
|-------------|--------------|
| (a) Infix | (b) Interfix |
| (c) Postfix | (d) Prefix |

5. The _____ is the topmost node in the tree Hierarchy which doesn't have any parent.

- | | |
|---------------|-------------------|
| (a) Leaf Node | (b) External Node |
| (c) Link | (d) Degree |

6. The number of nodes connected to a particular node is called _____.

- | | |
|------------|------------|
| (a) Depth | (b) Height |
| (c) Degree | (d) Domain |

7. A _____ graph is a graph in which there is an edge between every pair of vertices.

- (a) Undirected (b) Directed
(c) Weighted (d) Complete

8. A _____ in a graph is a path in which first and last vertex are the same.

- (a) Loop (b) Cycle
(c) Degree (d) length

9. If the number of records to be sorted is small, then _____ sorting can be efficient.

- (a) Merge (b) Heap
(c) Selection (d) Bubble

10. Which of the following is not a stable sorting algorithm?

- (a) Insertion sort (b) Selection sort
(c) Bubble sort (d) Merge sort

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).
Each answer should not exceed 250 words.

11. (a) List the Characteristics and Applications of Data Structure.

Or

(b) State the basic Operation on Doubly Linked List.

12. (a) Write notes on Infix Expression.

Or

(b) Mention the Application of Queue.

13. (a) List the Types of Binary Tree.

Or

(b) Write notes on Heap.

14. (a) Explain the Basic Terminology of Graph.

Or

(b) What is Euler Circuits? Explain.

15. (a) Mention the Difference between Sorting and Searching and its uses.

Or

- (b) State steps for Insertion Sort.

PART C — ($5 \times 8 = 40$ marks)

Answer ALL questions, choosing either (a) or (b).
Each answer should not exceed 600 words.

16. (a) Describe the Classification of Data Structures.

Or

- (b) Discuss about Polynomial Manipulations.

17. (a) Demonstrate the Implementation of Stack.

Or

- (b) Write notes on Priority Queue.

18. (a) Explain – Depth First Traversal in Binary Trees.

Or

- (b) Discuss about B tree and B + tree.

19. (a) Describe the steps in Breadth First Traversal in Graphs.

Or

- (b) Write a Summary on Types of Graphs.

20. (a) Differentiate the Linear Search with Binary Search.

Or

- (b) Explain the Selection Sort algorithm.
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