(6 pages) Reg. No. : .....

Code No. : 10801 E **Sub. Code : FSCS 21**

B.Sc. (CBCS) DEGREE EXAMINATION, APRIL 2026.

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. Which component directs the execution of instructions in the CPU?
   (a) ALU (b) Memory
   (c) Control Unit (d) Cache

2. _____ register holds the address of the next instruction to be fetched.
   (a) IR (b) AC
   (c) PC (d) MAR

3. What does the stack organization primarily handle?
   (a) Arithmetic computations
   (b) Cache management
   (c) Subroutine calls and returns
   (d) Instruction decoding

4. Subroutine return addresses are usually saved in
   (a) Main memory
   (b) Control bus
   (c) Stack
   (d) Cache

5. Which number representation is most efficient for arithmetic operations?
   (a) Sign-magnitude
   (b) One's complement
   (c) Two's complement
   (d) None of the above

6. A mantissa shift is often required during
   (a) Data transmission
   (b) Floating-point normalization
   (c) Instruction fetch
   (d) Stack manipulation

7. The algorithm used for signed binary multiplication is
   (a) Karatsuba (b) Booth's
   (c) RSA (d) Newton's

8. Devices can access memory directly without CPU help through
   (a) Paging (b) Segmentation
   (c) DMA (d) Pipelining

9. When data is searched by content instead of address, the memory used is
   (a) Main memory (b) Virtual memory
   (c) Associative memory (d) External memory

10. To make memory appear larger than it is, systems use
    (a) Paging (b) Caching
    (c) Virtual memory (d) Pipelining

PART B — (5 × 5 = 25 marks)

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

Each answer should not exceed 250 words.

11. (a) Briefly explain different types of computer registers and their purposes.

    Or

    (b) Define opcode. How is it used in an instruction format?

12. (a) Compare stack-based and register-based CPU organization.

    Or

    (b) Define indirect addressing mode with an example.

13. (a) Write a short note on binary multiplication hardware.

    Or

    (b) Explain subtraction using 2's complement method.

14. (a) Write the steps for floating-point addition.

    Or

    (b) Define and differentiate between programmed I/O and interrupt-driven I/O.

15. (a) Write the differences between RAM, ROM, and Cache.

Or

(b) How does associative memory differ from traditional RAM?

PART C — (5 × 8 = 40 marks)

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

Each answer should not exceed 600 words.

16. (a) Explain control memory design in a microprogrammed control unit.

Or

(b) Compare and contrast hardwired control and microprogrammed control.

17. (a) Explain the general register organization with a neat diagram.

Or

(b) Discuss different data transfer instructions with examples.

18. (a) Describe the non-restoring division method with an example.

Or

(b) Design and explain a 4-bit binary adder circuit.

19. (a) Explain how input/output interfacing is done in a computer system.

Or

(b) Describe the working of floating-point addition and multiplication in detail.

20. (a) Discuss the memory hierarchy with respect to access speed and cost.

Or

(b) Explain the structure and operation of virtual memory with page replacement strategies.

———————

(7 pages)

Reg. No. : .....

Code No. : 10800 E **Sub. Code : FECS 21**

B.Sc. (CBCS) DEGREE EXAMINATION,
APRIL 2026.

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. Which of the following is an example of set-builder notation?

   (a) $A = \{1,2,3\}$

   (b) $B = \{x | x \text{ is a prime number}\}$

   (c) $C = (1,2,3)$

   (d) $D = \{a, b, c\}$

2. If $A = \{1,2\}$ what is the power set P(A)?

   (a) {0, {1,2}} (b) {{1}, {2}}

   (c) {0, {1}, {2}, {1,2}} (d) {1,2}

3. Which of the following is an example of a function?

   (a) $f(x) = x^2$

   (b) $g(x) = \pm x$

   (c) h(x) = {(1,2),(1,3)}

   (d) r(x) = {(a,b), (b,x), (c,a)}

4. If the relation "congruence modulo 3" is defined on Z (set of integers), what is the equivalence class of 1?

   (a) { 1,3, 6,9}

   (b) {1, 2,3}

   (c) {1, 4, 7, 10}

   (d) {...,-5, -2, 1, 4, 7, 10 ...}

5. Which of the following is not a proposition?

   (a) "The sky is blue."

   (b) "2+2=4"

   (c) "What time is it?"

   (d) "Earth revolves around the Sun."

6. Which of the following is not a normal form in logic?

   (a) Conjunctive Normal Form (CNF)

   (b) Disjunctive Normal Form (DNF)

   (c) Implicative Normal Form (INF)

   (d) None of the above

7. If a matrix has m rows and n columns, it is called a:

   (a) Square matrix (b) Row matrix

   (c) m × n matrix (d) Column matrix

8. A symmetric matrix satisfies the condition:

   (a) $A^T = A$

   (b) $A^T A = I$

   (c) $A^T = -A$

   (d) $A^2 = 1$

9. A singular matrix is a square matrix whose determinant is:

   (a) Zero (b) One

   (c) Greater than zero (d) Less than zero

10. The inverse of a square matrix is denoted by:

    (a) A^T (b) adj(A)

    (c) A^{-1} (d) det(A)

PART B — (5 × 5 = 25 marks)

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

Each answer should not exceed 250 words.

11. (a) Convert the following set into roster form:

    A= {x | x is a prime number less than 15}.

    Or

    (b) Prove that $n(A \cup B) = n(A) + n(B) - n(A \cap B)$.

12. (a) What do you mean by Relation and give an example?

    Or

    (b) Let A = {1, 2, 3, 4, 5, 6} and the relation R be defined as R = {(x, y) | x ≡ y (mod 2)}. Find the equivalence classes.

13. (a) State and prove De Morgan's Laws by using truth table.

Or

(b) Construct the truth table for $(p \wedge q) \vee \neg p$.

14. (a) Show that matrix addition is associative, i.e.,(A+B)+C = A + (B + C).

Or

(b) Prove that for any square matrix A, then A - A^T is skew-symmetric.

15. (a) Find whether the matrix $A = \begin{bmatrix} 1 & 2 \\ 3 & 6 \end{bmatrix}$ is singular or non-singular.

Or

(b) Prove that for a non-singular matrix A, A × adj (A) = det (A) × I.

PART C — (5 × 8 = 40 marks)

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

Each answer should not exceed 600 words.

16. (a) Let $A = \{2, 4, 6, 8, 10\}$, $B = \{1, 2, 3, 4, 5, 6\}$, and $C = \{2, 4, 6\}$. Find $A \cup B$, $A \cap B$, $A - B$, and $B - C$.

Or

(b) (i) If $A \subseteq B$ and $B \subseteq C$, prove that $A \subseteq C$.

(ii) Show that $(A - B) \cup (B - A) = (A \cup B) - (A \cap B)$.

17. (a) Find whether the following relation is an equivalence relation :

$R = \{(1, 1), (2, 2), (3, 3), (1, 2), (2, 1)\}$ on $A = \{1, 2, 3\}$.

Or

(b) Prove that a relation R on a set A is an equivalence relation if and only if it is reflexive symmetric and transitive.

18. (a) (i) Prove the Law of Contraposition : If $p \rightarrow q$, then $\neg q \rightarrow \neg p$.

(ii) Show that $(p \wedge q) \vee (p \wedge \neg q)$ is logically equivalent to P using logical identities.

Or

(b) Construct the truth table for $(p \rightarrow q) \wedge (q \rightarrow r) \rightarrow (p \rightarrow r)$ and determine whether it is a tautology.

19. (a) If A is a square matrix, prove that $A + A^T$ is symmetric.

Or

(b) If A and B are two square matrixes of the same order, prove that $\det(AB) = \det(A) \times \det(B)$.

20. (a) Given the matrix $A = \begin{bmatrix} 2 & 4 & 6 \\ 1 & 3 & 5 \\ 0 & 1 & 2 \end{bmatrix}$ determine whether A is singular or non-singular.

Or

(b) Define adjoint of a square matrix. Find the adjoint of the matrix $A = \begin{bmatrix} 1 & 2 & 3 \\ 0 & 1 & 4 \\ 5 & 6 & 0 \end{bmatrix}$.
