Reg. No. : ....

Code No. : 20488 E Sub. Code : CACS 11/ CASE 11

B.Sc. (CBCS) DEGREE EXAMINATION, NOVEMBER 2023.

First Semester

Computer Science / Software Engineering — Allied

DISCRETE MATHEMATICS

(For those who joined in July 2021-2022)

Time : Three hours Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL the questions.

Choose the correct answer :

1. Which of these is not a type of relation?
   - (a) Reflexive
   - (b) Surjective
   - (c) Symmetric
   - (d) Transitive

2. Which of the following relations is symmetric and transitive but not reflexive for the set $I = \{4, 5\}$?
   - (a) $R = \{(4, 4), (5, 4), (5, 5)\}$
   - (b) $R = \{(4, 4), (5, 5)\}$
   - (c) $R = \{(4, 5), (5, 4)\}$
   - (d) $R = \{(4, 5), (5, 4), (4, 4)\}$

3. The following figure represents which type of function?
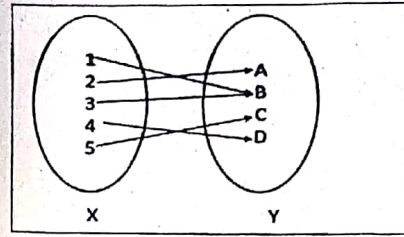
   - (a) One-One
   - (b) Onto
   - (c) Many-one
   - (d) Neither one-one nor onto

4. Let $A = \{1, 2, 3\}$ and $B = \{4, 5, 6\}$. Which one of the following functions is bijective?
   - (a) $f = \{(2, 4), (2, 5), (2, 6)\}$
   - (b) $f = \{(1, 5), (2, 4), (3, 4)\}$
   - (c) $f = \{(1, 4), (1, 5), (1, 6)\}$
   - (d) $f = \{(1, 4), (2, 5), (3, 6)\}$

5. Which of the following is not a statement?
   - (a) Every set is a finite set
   - (b) 8 is less than 6
   - (c) Where are you going?
   - (d) The Sum of interior angles of a triangle is 180 degrees

6. $p \to q$ is logically equivalent to —————.
   - (a) $\neg p \vee \neg q$
   - (b) $p \vee \neg q$
   - (c) $\neg p \vee q$
   - (d) $\neg p \wedge q$

7. If the order of the matrix is $m \times n$, then how many elements will there be in the matrix?
   - (a) mn
   - (b) $m^2 n^2$
   - (c) mn^2
   - (d) $2mn$

8. The matrix which follows the conditions $m = n$ is called?
   - (a) Square matrix
   - (b) Rectangular matrix
   - (c) Scalar matrix
   - (d) Diagonal matrix

9. A graph with all vertices having equal degree is known as a —————.
   - (a) Multi Graph
   - (b) Regular Graph
   - (c) Simple Graph
   - (d) Complete Graph

10. What is the maximum possible number of edges in a directed graph with no self loops having 8 vertices?
   - (a) 28
    - (b) 64
    - (c) 256
    - (d) 56

PART B — (5 × 5 = 25 marks)

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

Each answer should not exceed 250 words.

11. (a) What is Binary relation?

    Or

    (b) Let $f : \{2, 3, 4, 5\} \to \{3, 4, 5, 9\}$ and $g : (3, 4, 5, 9) \to \{7, 11, 15\}$ be functions defined as $f(2) = 3$, $f(3) = 4$, $f(4) = f(5) = 5$ and $g(3) = g(4) = 7$ and $g(5) = g(9) = 11$. Find $g \circ f(x)$.

12. (a) What is the Composition of Functions?

    Or

    (b) Find $fg(3)$ if $f(x) = 2x$ and $g(x) = x + 1$.

13. (a) Explain Disjunctive Normal Forms (DNF).

    Or

    (b) Prove $[(A \to B) \wedge A] \to B$ is a tautology.

14. (a) What is the Transpose of a Matrix? Find the transpose for $\begin{matrix} 1 & 2 \\ 4 & 3 \\ 5 & 6 \end{matrix}$.

    Or

    (b) What are the properties of Skew-Symmetric Matrix?

15. (a) Show that the graph G and G' mentioned above are isomorphic.
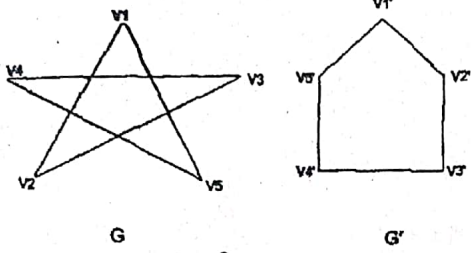
G   G'

Or

(b) What is union of two graphs in graph theory?

PART C — (5 × 8 = 40 marks)

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

Each answer should not exceed 600 words.

16. (a) Using the table below, evaluate $f \circ g(3)$ and $f \circ f(1)$.

x	$f(x)$	$g(x)$
1	3	2
2	7	3
3	8	5
4	6	7
5	2	9

Or

(b) Find the inverse of $f(x) = 6x + 10$.

17. (a) Given $f(x) = 3x + 2$ and $g(x) = 4 - 5x$, find $(f + g)(x)$, $(f - g)(x)$, $(f \times g)(x)$ and $(f / g)(x)$.

Or

(b) If $f(x) = x^2$ and $g(x) = x + 3$. Then calculate the composition $g(f(x))$ and $f(g(x))$.

18. (a) Prove $(A \vee B) \wedge [(\neg A) \wedge (\neg B)]$ is a contradiction.

Or

(b) Obtain DNF of $Q \vee (P \wedge R) \wedge \neg((P \vee R) \wedge Q)$.

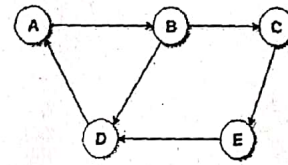19. (a) Find the determination of given matrix $\begin{bmatrix} 6 & 1 & 1 \\ 4 & -2 & 5 \\ 2 & 8 & 7 \end{bmatrix}$.

Or

(b) Discuss the differences between Singular and Non-Singular Matrix.

20. (a) Write detail about types of graph with example.

Or

(b) Find the adjacency matrix of the following graph.

Directed Graph