

Code No. : 20412 E Sub. Code : CACS 11/
CASE 11

B.Sc.(CBCS) DEGREE EXAMINATION,
NOVEMBER 2022.

First Semester

Computer Science/Software Engineering

DISCRETE MATHEMATICS

(For those who joined in July 2021 onwards)

Time : Three hours Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. If R is a relation "Less Than" from $A = \{1, 2, 3, 4\}$ to $B = \{1, 3, 5\}$ then RoR^{-1} is _____
- (a) $\{(3,3), (3,4), (3,5)\}$
 (b) $\{(3,1), (5,1), (3,2), (5,2), (5,3), (5,4)\}$
 (c) $\{(3,3), (3,5), (5,3), (5,5)\}$
 (d) $\{(1,3), (1,5), (2,3), (2,5), (3,5), (4,5)\}$

6. Let A order $(a \times b)$ and B order $(c \times d)$ be two matrices, then if AB exists, the order of AB is _____
- (a) $a \times d$ (b) $b \times c$
 (c) $a \times b$ (d) $c \times d$
7. All the diagonal elements of a skew-symmetric matrix is _____
- (a) 0 (b) 1
 (c) 2 (d) Any integer
8. The binary relation $U = \Phi$ (empty set) on a set $A = \{11, 23, 35\}$ is _____
- (a) Neither reflexive nor symmetric
 (b) Symmetric and reflexive
 (c) Transitive and reflexive
 (d) Transitive and symmetric
9. A graph is a collection of _____
- (a) Row and columns (b) Vertices and edges
 (c) Equations (d) None of these
10. A graph G is called a _____ if it is a connected acyclic graph
- (a) Cyclic graph (b) Regular graph
 (c) Tree (d) Not a graph

2. R is a binary relation on a set S and R is reflexive if and only if _____
- (a) $r(R) = R$ (b) $s(R) = R$
 (c) $t(R) = R$ (d) $f(R) = R$
3. Which of the following statement is a proposition?
- (a) Get me a glass of milkshake
 (b) God bless you!
 (c) What is the time now?
 (d) The only odd prime number is 2
4. A function is said to be _____ if and only if $f(a) = f(b)$ implies that $a = b$ for all a and b in the domain of f .
- (a) One-to-many (b) One-to-one
 (c) Many-to-many (d) Many-to-one
5. Let f and g be the function from the set of integers to itself, defined by $f(x) = 2x + 1$ and $g(x) = 3x + 4$. Then the composition of f and g is _____
- (a) $6x + 9$ (b) $6x + 7$
 (c) $6x + 6$ (d) $6x + 8$

PART B — (5 × 5 = 25 marks)

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

11. (a) Consider $A = \{1, 2, 3, 4\}$ and $B = \{3, 4, 5, 6\}$. Find the elements of each relation R stated below. Also, find the domain and range of R.
- $a \in A$ is related to $b \in B$ i.e., aRb , if and only if $a < b$
- Or
- (b) Find the number of distinct relations from a set A to a set B.
12. (a) Let $A = \{a, b, c\}$, $B = \{1, 2, 3\}$ and $f = \{(a, 1), (b, 3), (c, 2)\}$. Determine the inverse.
- Or
- (b) Give the f_1 and f_2 are functions from R to R, in which $f_1(x) = x$ and $f_2(x) = (1/x) - x$. Determine the functions $f_1 + f_2$ and $f_1 f_2$
13. (a) Write down the laws of formal logic.
- Or
- (b) Find the negation of the following propositions:
- (i) Today is Saturday.
 (ii) It is a rainy day.
 (iii) It snows and Mona does not drive the car.

14. (a) If A is any square matrix, show that $\Lambda\Lambda^T$ is symmetric matrix.

Or

- (b) If both A and B are skew-symmetric matrices of the same order such that $AB = BA$, then show that AB is symmetric.

15. (a) Distinguish between the undirected and directed graphs.

Or

- (b) Explain the representation of graph.

PART C — (5 × 8 = 40 marks)

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

16. (a) Find the composition of the relations

$$R_1 = \{(1, 2), (1, 6), (2, 4), (3, 4), (3, 6), (3, 8)\} \text{ and}$$

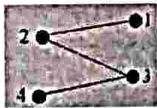
$$R_2 = \{(2, x), (4, y), (4, z), (6, z), (8, x)\}$$

Or

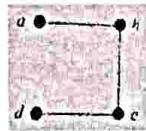
- (b) Let $A = \{1, 2, 3, 4\}$ and $B = \{p, q, r, s\}$ and $R = \{(1, p), (1, q), (1, r), (2, q), (2, r), (2, s)\}$. Find M_R .

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20. (a) Show the two graphs as shown in figure (a) and figure (b) are isomorphic



(a)



(b)

Or

- (b) What are the operations on graphs? Explain.

17. (a) Let g be the function from the set $\{a, b, c\}$ to itself such that $g(a) = b$, $g(b) = c$, and $g(c) = a$. Let f be the function from the set $\{a, b, c\}$ to the set $\{1, 2, 3\}$ such that $f(a) = 3$, $f(b) = 2$, and $f(c) = 1$. Determine the composition of f and g and also the composition of g and f .

Or

- (b) Show that the function $f(x) = x^3$ and $g(x) = x^{1/3}$ for all $x \in R$ are inverse of each other.

18. (a) Show that $p \Rightarrow q$ is the same as $\sim q \Rightarrow \sim p$.

Or

- (b) Show that the proposition $(p \wedge \sim q) \vee \sim(p \wedge q)$ is a tautology.

19. (a) What are the types of matrices? Explain.

Or

- (b) If the product of two non-zero square matrices is a zero matrix, then prove that both of them are singular matrices.

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