(8 pages) **Reg. No. :** .....

Code No. : 21265 **Sub. Code : SACS 1**
SASE 1

B.Sc. (CBCS) DEGREE EXAMINATION, APRIL 201

First Semester

Computer Science/ Software Engineering – Allied

DISCRETE MATHEMATICS

(For those who joined in July 2017 onwards)

Time : Three hours Maximum : 75 ma

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer:

1. A relation R on set A is _____ whether $(a,b) \in R$ then $(b,a) \in R$.

   (a) Reflexive

   (b) Irreflexive

   (c) Symmetric

   (d) Non symmetric

The _____ closure is the smallest symmetric relation that contains R as a subset.

(a) Non symmetric (b) Symmetric

(c) Reflexive (d) Irreflexive

The inverse of the exponential function is called the _____ function.

(a) Rational (b) Logarithm

(c) Trigonometric (d) Irrational

The _____ function is after also called the greatest integer function.

(a) Ceiling (b) Floor

(c) Sum (d) Count

_____ is a conjunction $p \wedge q$ consists of two sub-statements p and q both of which exist simultaneously.

(a) Negative conjunction

(b) Negative of disjunction

(c) Negation of conjunction

(d) Negation of disjunction

6. A proposition obtained from the combination of two or more proposition is referred to as _____ proposition.

(a) primary (b) automatic

(c) molecular (d) primitive

7. A matrix in which the number of rows is equal to the number of column is called as _____ matrix.

(a) Null (b) Row

(c) Scalar (d) Square

8. A square matrix whose elements except those in the leading diagonal are zero is called _____ matrix.

(a) unit (b) diagonal

(c) null (d) zero

9. A graphs consists of finite number of vertices and finite number of edges are called _____

(a) Complete (b) Finite

(c) Infinite (d) Isolated

10. A graph in which loops and multiple edges are allowed, is called _____.

(a) Multigraph (b) Simple

(c) Double (d) Pseudo graph

PART B — (5 × 5 = 25 marks)

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

Each answer should not exceed 250 words.

11. (a) If $A=\{x,y,z\}$, $B=\{x,y,z\}$, $C=\{x,y\}$ $D=\{y,z\}$. R is a relation from A to B defined by $R=\{(x,X),(x,Y),(y,Z)\}$ and S is a relation from G to D defined by $S=\{(x,Y),(y,Z)\}$ find R', $R\cup S$, $R\cap S$ and $R-S$.

Or

(b) Consider a relation R denoted on $A=\{1,2,3\}$ whose matrix representation is given below. Determine its inverse R^{-1} and complement R^1.

$$M_R=\begin{bmatrix}1 & 0 & 0\\ 1 & 1 & 1\\ 0 & 0 & 1\end{bmatrix}.$$

12. (a) Discuss about transcendental functions.

Or

(b) Let $f(x)=a_nx^n+a_{x-1}+a_{x-1}x_{x-1}+\ldots+a_1xa_0$ where $a_0,a_1,a_2,\ldots,a_{n-1}$, a_n are real number then prove $f(x)$ is $0(x_3)$.

13. (a) Form the conjunction of p and q for each of the following

(i) p : Ram is healthy q : He has blue eyes

(ii) p : It is cold q : It is raining

(iii) p : $5x+6=26$ q : $x>3$.

Or

(b) Obtain a conjunctive normal form of the following:

(i) $p \wedge (p \Rightarrow q)$

(ii) $[q \vee (p \wedge q)] \wedge \sim [(p \vee r) \wedge q]$.

14. (a) Find x, y, z and t if

$$2\begin{bmatrix} x & z \\ y & t \end{bmatrix} + 3\begin{bmatrix} 1 & -1 \\ 0 & 0 \end{bmatrix} = 3\begin{bmatrix} 3 & 5 \\ 4 & 6 \end{bmatrix}.$$

Or

(b) Find the adjoint of $\begin{bmatrix} 4 & 2 \\ -1 & 3 \end{bmatrix}$.

(a) If $f(x) = x^2 - 5x + 6$ find $f(A)$ if $A = \begin{bmatrix} 2 & 0 & 1 \\ 2 & 1 & 3 \\ 1 & -1 & 0 \end{bmatrix}$.

Or

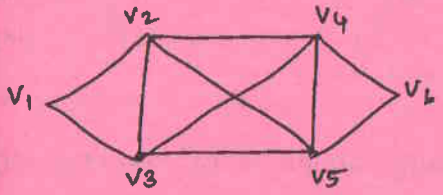
(b) If $A = \begin{bmatrix} 3 & 2 \\ 7 & 5 \end{bmatrix}$ and $B = \begin{bmatrix} 6 & 7 \\ 8 & 9 \end{bmatrix}$, verify that $(AB)^{-1} = B^{-1}A^{-1}$.

(a) Show that the maximum number of edges in a simple graph with n vertices is $\frac{n(n-1)}{2}$.

Or

(b) Explain the various operation of graphs.

(a) Find the degree of each vertex of the following graph.



Or

(b) Discuss about types of graph.

PART C — (5 × 8 = 40 marks)

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

Each answer should not exceed 600 words.

(a) Write detail notes on closure of Relation.

Or

(b) Let $A\{1,2,3\}$ and $B=\{a,b,c,d\}$. Let R and S be the relations from A to B with Boolean matrices.

$$M_R=\begin{bmatrix}1&0&1&0\\0&1&0&0\\1&0&0&1\end{bmatrix} \text{ and } M_S=\begin{bmatrix}0&1&0&0\\1&0&0&1\\0&1&1&0\end{bmatrix}.$$

(i) Find Boolean matrices for $\underline{R^{-1}}$ and $\underline{S^{-1}}$.

(ii) Find Boolean matrices for $\underline{(R\cap S)\circ R^{-1}}$ and $\underline{R\circ R^{-1}\cap S\circ R^{-1}}$.

17. (a) Let $f: A \to B$, $g: B \to C$ and $h: C \to \infty$ the prove $h \circ (g \circ f) = (h \circ g) \circ f$.

Or

(b) Show that the mapping $f: R \to R$ be defi by $f(x) = ax + b$, where $a, b, x \in R$, $a \neq 0$ invertible define its inverse.

18. (a) Consider the following

p : you take a course in Discrete mathemat

q : you understand logic

r : you get an A on the final exam.

Write in simple sentences the meaning of following.

(i) $q \Rightarrow r$ (ii) $-p \Rightarrow -q$ (iii) $(p \wedge q)$
(iv) $(pn - q) \Rightarrow -r$ (v) $-(-r)$.

Or

(b) Construct the truth tables for the following

(i) $-(p \wedge q) \vee -(q \Leftrightarrow p)$

(ii) $(p \Rightarrow q) \vee -(p \Leftrightarrow -q)$

(iii) $p \wedge -r \Leftrightarrow q \vee r$

(iv) $[(p \wedge q) \vee (-r)] \Leftrightarrow p$.

(a) If $f(x) = x^2 - 5x + 6$ find $f(A)$ if $A = \begin{bmatrix} 2 & 0 & 1 \\ 2 & 1 & 3 \\ 1 & -1 & 0 \end{bmatrix}$.

Or

(b) If $A = \begin{bmatrix} 3 & 2 \\ 7 & 5 \end{bmatrix}$ and $B = \begin{bmatrix} 6 & 7 \\ 8 & 9 \end{bmatrix}$, verify that $(AB)^{-1} = B^{-1}A^{-1}$.

(a) Show that the maximum number of edges in a simple graph with n vertices is $\frac{n(n-1)}{2}$.

Or

(b) Explain the various operation of graphs.
