Reg. No. : ....

Code No. : 20343 E   **Sub. Code : SACS 11/
SASE 11/AACS 11/
AASE 11/CACS11**

B.Sc. (CBCS) DEGREE EXAMINATION,
NOVEMBER 2021.

First Semester

Computer Science/Software Engineering — Allied

DISCRETE MATHEMATICS

(For those who joined in July 2017 onwards)

Time : Three hours   Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answers :

1.   A relation is ————— if no two distinct points in the diagraph have an edge going between them in both directions.

     (a) Reflexive   (b) Symmetric

     (c) Asymmetric   (d) Transitive

2. ———————— is a relation $\underline{\underline{R}}$ on a set $\underline{\underline{A}}$ is non-reflexive if $\underline{\underline{R}}$ is neither reflexive nor irreflexive.

   (a) Reflexive relation

   (b) Irreflexive relation

   (c) Non-reflexive relation

   (d) Symmetric relation

3. ———————— function is also called as one to one correspondence.

   (a) Into   (b) Onto

   (c) Bijective   (d) Objective

4. Onto function is also called as ———————— function.

   (a) Objective   (b) Subjective

   (c) Surjective   (d) Bijective

5. A proposition consisting of only a single propositional variable is called ———————— proposition.

   (a) Primary   (b) Molecular

   (c) Compound   (d) Complex

6. The standard forms are called ———————— forms.

   (a) Canonical   (b) Negation

   (c) Conjuction   (d) Disjunction

7. A matrix whose elements expect those in the leading diagonal are zero is called a ————— matrix.

   (a) Unit   (b) Scalar

   (c) Diagonal   (d) Zero

8. In a matrix if $a_{ij} = 0$ for all $i \neq j$ is called as —————

   (a) zero   (b) diagonal

   (c) scalar   (d) unit

9. The number of vertices in G and is called the ————— of G.

   (a) points   (b) node

   (c) order   (d) value

10. In a graph a node that is not adjacent to another node is called ————— node.

    (a) incident   (b) adjacent

    (c) isolated   (d) connected

PART B — (5 × 5 = 25 marks)

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

11. (a) Write short notes on transitive relation.

Or

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

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

12. (a) Show that the function $f(x) = x^3$ and $g(x) = x^{1/3}$ for all $x \in R$ are inverse of one another.

Or

(b) What is recursively defined function?

13. (a) Write short notes on derived connectives.

Or

(b) Construct the truth table $-(p \wedge q) \vee -(q \Leftrightarrow p)$.

14. (a) Find (i) $2A + 3B + C$ (ii) $3A - 2B$ if

$A = \begin{bmatrix} 2 & 5 \\ 0 & 7 \end{bmatrix}$ $B = \begin{bmatrix} 1 & -1 \\ 6 & 2 \end{bmatrix}$ $C = \begin{bmatrix} 0 & 0 \\ -1 & 2 \end{bmatrix}$.

Or

(b) Compute A^2 and A^3 if $A = \begin{bmatrix} 0 & i \\ i & 0 \end{bmatrix}$ $i = -1$.

15. (a) List out the basic terminology of graph.

Or

(b) What is the size of an r − regular (p,q) - graph?

PART C — (5 × 8 = 40 marks)

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

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

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

(i) find Boolean matrices for R^{-1} and S^{-1}

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

Or

(b) Discuss about the Clouoer operations on relations.

17. (a) Write detail notes on primitive recursive functions.

Or

(b) Explain the various types of functions.

18. (a) Obtain the conjuctive normal form of the following.

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

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

Or

(b) Discuss about proposition and truth table.

19. (a) Show that $A = \begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & 2 \\ 2 & 2 & 1 \end{bmatrix}$ satisfies the equation $A^2 - 4A - 5I = 0$.
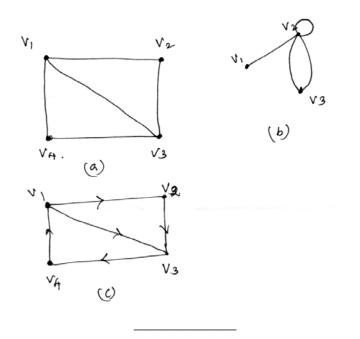
Or

(b) Write detail notes on matrix and its types.

20. (a) Discuss about operations on graphs.

Or

(b) Use adjacency matrix to represent the graphs.

(a)

(b)

(c)