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

Code No. : 33009 E **Sub. Code : AACS 11/ AASE 11**

B.Sc. (CBCS) DEGREE EXAMINATION, NOVEMBER 2020.

First Semester

Computer Science / Software Engineering – Allied

DISCRETE MATHEMATICS

(For those who joined in July 2020 onwards)

Time : Three hours Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. The relation '≤' on the set R of real number is _____.

(a) reflexive (b) symmetric

(c) equivalence (d) none of these

2. A relation R on a set A is ———————— if whenever aRb and bRc then aRc

(a) reflexive (b) antisymmetric

(c) symmetric (d) transitive

3. The absolute value of (-3.33) is

(a) 3.33 (b) –3

(c) 3 (d) 0.33

4. Logarithms to base 2 is called ———————— logarithms.

(a) base (b) common

(c) natural (d) binary

5. Which of the following is not a proposition?

(a) Paris is in France

(b) London in Denmark

(c) $1+1=2$

(d) Where are you going?

6. A proposition is said to be ———————— if it cannot be broken down into simplex propositions.

(a) primitive (b) compound

(c) composite (d) connected

7. The number of elements in the $m \times n$ matrix is

(a) mn (b) $m \times n$

(c) $2m$ (d) m^2

8. If A is an $m \times p$ matrix and B is a $p \times m$ matrix then order of AB is

(a) $m \times p$ (b) $m \times m$

(c) $p \times p$ (d) none

9. The degree of the vertex is one the its is known as ———— vertex

(a) pendent (b) isolated

(c) loop (d) none

10. A cycle-free graph is known as ————

(a) connected (b) circuit

(c) path (d) tree

PART B — (5 × 5 = 25 marks)

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

11. (a) Prove that if A, B, C sets then $A \times (B \cap C) = (A \times B) \cap (A \times C)$.

Or

(b) If $A = \{2,3,5\}$, $B = \{6,8,10\}$, $C = \{2,3\}$, and $D = \{8,10\}$ are four non empty sets $R = \{(2,6),(2,8),(3,10)\}$ and the relation S from C to D $S = \{(2,8),(3,10)\}$ find $R \cup S, R \cap S, R - S$ and R^1.

12. (a) Let $x = \{1,2,3,4\}$. Determine whether or not each relation below a function from x into X.

(i) $f = \{(2,3),(1,4),(2,1)(3,2),(4,4)\}$

(ii) $g = \{(3,1),(4,2),(1,1)\}$

(iii) $h = \{(2,1),(3,4),(1,4),(2,1),(4,4)\}$.

Or

(b) Prove that $f : A \to B$ is a one-one and onto function then

(i) f^{-1} of $= I_A$

(ii) $f \circ f^{-1} = I_B$ where I_A and I_B are the identify function of the set A and B.

13. (a) Let p denotes 'It rains' q denotes 'The atmospheric humidity increases'. Write the following statements in symbolic form.

(i) Atmospheric humidity increases only if it rains.

(ii) Sufficient condition for it to rain is that atmospheric humidity increases

(iii) Necessary condition for it to rain is that atmospheric humidity increases.

(iv) Whenever atmospheric humidity increases it rains.

Or

(b) Test the validity of the statement.

(i) $\begin{array}{l} p \vee q \\ \sim q \\ \hline \therefore p \wedge \sim q \end{array}$

(ii) $\begin{array}{l} q \vee (p \vee r) \\ \sim r \\ \hline \therefore p \vee q \end{array}$.

14. (a) Write the properties of matrix operation.

Or

(b) If $A = \begin{bmatrix} 1 & 2 \\ 3 & -4 \end{bmatrix}$ find $A^3, 2A^2 - 3A + 5$.

15. (a) Define isomorphism of Graph give an example:

Or

(b) Prove that there is unique path between each pair of vertices in a tree $T(V,E)$.

PART C — ($5 \times 8 = 40$ marks)

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

16. (a) Explain the types of relations and give an example.

Or

(b) Let $R = \{(1,2),(3,4),(2,2)\}$ and $S = \{(4,2),(2,5),(3,1),(1,3)\}$. Find $R \circ S, S \circ R, R \circ (S \circ R), (R \circ S) \circ R, R \circ R, S \circ S$ and $R \circ R \circ R$.

17. (a) If S and T are non-empty sets then prove that there exists a one-to-one correspondence between $(S \times T)$ and $(T \times S)$.

Or

(b) Prove that $f^{-1} \circ g^{-1} = (g \circ f)^{-1}$ where $f : Q \to Q$ such that $f(x) = 2x$ and $g(x) : Q \to Q$ such that $g(x) = x + 2$ are two functions.

18. (a) Test the validity of the following arguments "If my brother passes the examination of the institute of Chartered Accountants in the first attempt. I will give him a valuable prize. Either he passes the examination or I was out of station. I did not give my brother a prize this time although he passed the examination. Therefore I was out of station.

Or

(b) Construct the truth table for the following and write the truth set $P \Rightarrow [(p \vee r) \wedge \sim (p \Rightarrow \sim r)]$.

19. (a) Solve $x + 2y + 3z = 14$, $3x + y + 2z = 11$, $2x + 3y + z = 11$.

Or

(b) Find the inverse of $\begin{bmatrix} 2 & 1 & 1 \\ 3 & 2 & 3 \\ 1 & 4 & 9 \end{bmatrix}$.

20. (a) Explain the types of graphs in detail.

Or

(b) Prove that the number of pendant vertices in a tree is equal to $p = \frac{(n+1)}{2}$ where n is the number of vertices in a binary tree.
