

(6 pages)

Reg. No. :

Code No. : 20999

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GASE 11

B.Sc. (CBCS) DEGREE EXAMINATION,
NOVEMBER 2015.

First Semester

Computer Science – Allied

DISCRETE MATHEMATICS

(For those who joined in July 2012 and afterwards)

Time : Three hours

Maximum : 75 marks

PART A — ($10 \times 1 = 10$ marks)

Answer ALL questions.

Choose the correct answer.

1. If $A \times B = B \times A$ then
 - (a) $A = B$
 - (b) $A \subset B$
 - (c) $B \subset A$
 - (d) None of these
2. $(A')' = ?$
 - (a) A
 - (b) $\cup$
 - (c) ϕ
 - (d) None of the above

3. Let f is a one-to-one function and if $f(a_1) = f(a_2)$ then

- (a) $a_1 = a_2$
- (b) $a_1 = a_1$
- (c) $a_2 = a_2$
- (d) $a_1 \subset a_2$

4. The composition of function is not _____.

- (a) Commutative
- (b) Associative
- (c) Distributive
- (d) None of these

5. The following operator is called as conjunction

- (a) $\wedge$
- (b) $\vee$
- (c) $\sim$
- (d) All of these

6. If $p \rightarrow q$ is false then $P =$ _____ and $q =$ _____.

- (a) T, F
- (b) F, T
- (c) T, T
- (d) F, F

7. Triangular matrix need not be a _____ matrix.

- (a) Square
- (b) Unit
- (c) Column
- (d) Row

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8. In unit matrix diagonal elements are ———.
- (a) 0 (b) 1
(c) 2 (d) 3
9. The in-degree of a vertex v of G is denoted by $\deg^-(v)$
- (a) G^+ (b) G^-
(c) G^* (d) G^+
10. Binary search has atmost ——— children.
- (a) 2 (b) 3
(c) 4 (d) 0

PART B — ($5 \times 5 = 25$ marks)

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

Each answer should not exceed 250 words.

11. (a) Let $A = \{a, b\}$ and $B = \{b, c, a\}$ then find $A \times B$.
- Or
- (b) Explain symmetric relation with example.
12. (a) Explain one-to-one function.
- Or
- (b) Let $A \rightarrow B$ and $g: B \rightarrow C$ be two function show that $g \circ f$ is injective.

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13. (a) Show that $p \Rightarrow q$ is equal to $\sim q \Rightarrow \sim p$

Or

- (b) To prove that $p \vee \sim p$ is a tautology.

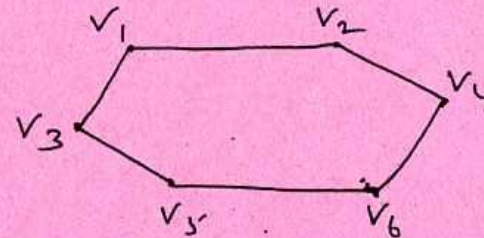
14. (a) Let $A = \begin{pmatrix} 5 & 0 & -2 \\ 3 & 2 & -2 \end{pmatrix}$ and $B = \begin{pmatrix} 4 & -3 & -6 \\ -1 & 0 & 4 \end{pmatrix}$
find $A + B$ and $A - B$.

Or

- (b) Verify the matrix $A = \begin{pmatrix} a & b & c \\ b & d & e \\ c & e & f \end{pmatrix}$ is symmetric

or not.

15. (a) Show that the graph shown below is bipartite graph.



Or

- (b) Draw all the trees with four vertices.

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[P.T.O.]



PART C — (5 × 8 = 40 marks)

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

Each answer should not exceed 600 words.

16. (a) Prove that :

- (i) $A \cap A = A$
- (ii) $A \cap B = B \cap A$
- (iii) $(A \cap B) \cap C = A \cap (B \cap C)$.

Or

(b) Draw the Venn diagram for

- (i) $A \subseteq B$
- (ii) A and B
- (iii) $A \cap B \cap C$
- (iv) $A \cup (B \cap C)$.

17. (a) Let $Y = \{a, b, c\}$. Define $f : Y \rightarrow Y$ such that $f = \{(a, b), (b, a), (c, a)\}$ determine :

- (i) f^{-1}
- (ii) f^2
- (iii) f^3
- (iv) f^4 .

Or

(b) Prove that $f : N \rightarrow N$ where $f(x) = x^2$ is injective, but the similar function $g : z \rightarrow 2$, where $g(x) = x^2$ is not injective.

18. (a) Show that $p \wedge (q \vee r)$ is equivalent to $(p \wedge q) \vee (p \wedge r)$.

Or

(b) Find the DNF of $\sim (p \vee q) \Leftrightarrow (p \wedge q)$.

19. (a) Prove that $A^3 - 4A^2 - 3A + I = 0$ where

$$A = \begin{bmatrix} 1 & 3 & 2 \\ 2 & 0 & -1 \\ 1 & 2 & 3 \end{bmatrix}.$$

Or

(b) If a matrix A is non-singular then prove that :

- (i) $(A^{-1})^{-1} = A$
- (ii) $(A^{-1})^T = (A^T)^{-1}$.

20. (a) Prove that, in a graph, total number of odd degree vertices is even but the number of even degree vertices may be odd.

Or

(b) Explain the following :

- (i) Null graph
- (ii) Complete graph
- (iii) Skewed tree
- (iv) Bipartite graph.

