

(7 pages)

Reg. No. :

Code No. : 20999

Sub. Code : GACS 11/
GASE 11

B.Sc. (CBCS) DEGREE EXAMINATION,
NOVEMBER 2014.

First Semester

Computer Science – Allied

Paper I — DISCRETE MATHEMATICS

(Also common to Software Engineering)

(For those who joined in July 2012 onwards)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer.

1. Every set is a subset of _____.

- (a) It self (b) Empty set
(c) Intersection (d) None of these

2. Venn diagram is used to represent _____ among students.

- (a) Relationship (b) Difference
(c) Variance (d) All of these

3. In one-to-one function $f(a_1) = f(a_2)$ then

- (a) $a_1 = a_2$ (b) $a_1 = a_1$
(c) $a_2 = a_2$ (d) None of these

4. The composition of function's not _____.

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

5. Let P : Vidyanarayan is tall and q : Vidyanarayan is intelligent the symbolic form for following statement is "Vidyanarayan is tall and intelligent"

- (a) $P \vee Q$ (b) $P \wedge Q$
(c) $\sim P$ (d) $\sim Q$

6. Which of the following is idempotent law?

- (a) $P \vee T = T$ (b) $T \wedge P = P$
(c) $P \wedge P = P$ (d) None of these

Page 2 Code No. : 20999



7. In upper triangular matrix all elements _____ the main diagonal are zero

- (a) Above (b) Below
(c) Middle (d) None of these

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 tree has at most _____ 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) List the power set for following :

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

(ii) $B = \{\phi\}$.

Or

(b) What is universal set and empty set?

12. (a) Let f and g be the functions from the set of integers defined by $f(x) = 2x + 3$ and $g(x) = 3x + 2$. Determine $f \circ g$.

Or

(b) What is Identity function? Give example.

13. (a) Show that $P = q^3$ is equal to $\sim q \Rightarrow \sim p$.

Or

(b) 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) Explain the inverse of matrix.
15. (a) If $G = (V, E)$ be a direct graph with e number of edges then prove number of out degree of G = number of in degree of G .

Or

- (b) Prove that a tree with more than 1 vertex has atleast 2 leaves.

PART C — ($5 \times 8 = 40$ marks)

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

Each answer should not exceed 600 words.

16. (a) Draw the venn diagram for
- (i) $A \subseteq B$
 - (ii) A and B
 - (iii) A and B are disjoint
 - (iv) $A \cap B$.

Or

Page 5 Code No. : 20999

- (b) Let the function $f : R \rightarrow R$ be defined by

$$f(x) = \begin{cases} 2x + 5 & x > 9 \\ x^2 - |x|, & x \in [-9, 9] \\ x - 4, & x < -9 \end{cases}$$

Determine :

- (i) $f(3)$
 - (ii) $f(-15)$
 - (iii) $f^2(15)$
17. (a) Prove that $f : N \rightarrow N$, where $f(x) = x^2$ is injective (one-to-one), but the similar function $g : Z \rightarrow Z$ where $g(x) = x^2$ is not injective.

Or

- (b) Consider the functions $f : A \rightarrow B$ and $g : B \rightarrow C$ prove the following :
- (i) If f and g are onto functions, then $g \circ f$ is one-to-one
 - (ii) $g \circ f$ is onto.

18. (a) Using the laws of propositions prove the following $\sim (p \vee q) \vee (\sim p \wedge q) \equiv \sim p$.

Or

- (b) Explain Demorgan's law. Prove that $\sim (p \vee q) \equiv (\sim p) \wedge (\sim q)$ by using demorgan's law.

Page 6 Code No. : 20999



19. (a) Find the adjoint of $A = \begin{bmatrix} 1 & 2 & 3 \\ 2 & -4 & 5 \\ 6 & 1 & 0 \end{bmatrix}$ verify that $A(\text{adj}A) = (\text{adj}A)A$.

Or

- (b) Show that the matrix $A = \begin{bmatrix} -5 & -8 & 0 \\ 3 & 5 & 0 \\ 1 & 2 & -1 \end{bmatrix}$ is involutory.

20. (a) Show that maximum number of vertices in a binary tree of height n is $2^{n+1} - 1$.

Or

- (b) Explain traversal of a tree with example.

