

Reg. No. :

**Sub. Code : JACA 21/
SACA 21**

Second Semester

MATHEMATICAL FOUNDATION FOR
COMPUTER SCIENCE

Time : Three hours

Maximum : 75 marks

Answer ALL questions.

1. The power set of the set $\{1, 2, 3\}$ has _____ elements.

- [illegible]

2. If ρ is a relation defined on S such that $a \rho a, \forall a \in S$, then ρ is _____.
(a) reflexive (b) symmetric
(c) transitive (d) equivalence
3. A function for which inverse exists is a _____.
(a) surjection (b) injection
(c) bijection (d) identity
4. If $f : Z \rightarrow Z$ is defined as $f(x) = 2x$, then range of f is _____.
(a) Z (b) $2Z$
(c) $\{2\}$ (d) None
5. $\neg(P \vee Q) =$ _____.
(a) $\neg P \wedge \neg Q$ (b) $\neg P \wedge Q$
(c) $\neg P \vee \neg Q$ (d) $\neg P \vee Q$
6. $p \rightarrow q = F$ when
(a) $p = T$ and $q = T$
(b) $p = F$ and $q = T$
(c) $p = F$ and $q = F$
(d) $p = T$ and $q = F$

7. If two points are joined by more than one line, then the lines are called _____.
- (a) loops (b) multilines
(c) pseudolines (d) directed lines
8. A graph with all vertices having same degree is called _____.
- (a) complete graph (b) null graph
(c) regular graph (d) multigraph
9. A graph with exactly one component is called _____.
- (a) Connected graph (b) Disconnected graph
(c) Simple graph (d) Euler graph
10. A tree with n vertices has _____ edges.
- (a) $n + 1$ (b) n
(c) $n - 1$ (d) $2n$

PART B — ($5 \times 5 = 25$ marks)

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

11. (a) If $A = \{a, b, c\}$ and $B = \{c, d, e\}$, find
- (i) $A \cup B$
(ii) $A \cap B$
(iii) $A - B$.

Or

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- (b) Show that :
- (i) $A \cap A = A$
(ii) $A \cup A = A$
(iii) $A \cap \varphi = \varphi$

12. (a) Find the inverse of the functions
- (i) $f : R \rightarrow R$ given by $f(x) = x + 10$
(ii) $f : R^* \rightarrow R^*$ given by $f(x) = 1/x$.

Or

- (b) Show that the following functions are 1 - 1 and onto
- (i) $f : R \rightarrow R$ given by $f(x) = 7x + 3$
(ii) $f : Z \rightarrow E$ given by $f(x) = 2n$.

13. (a) Give the truth table for :
- (i) conjunction
(ii) disjunction.

Or

- (b) For p : "Today is very hot" q : "It may rain today". Find
- (i) $p \vee q$
(ii) $p \wedge q$
(iii) $\neg p$
(iv) $\neg q$.

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[P.T.O.]



14. (a) Show that the sum of degrees of all vertices (points) in a graph is two times the number of lines.

Or

- (b) Define the following :

- (i) complete graph
- (ii) cubic graph
- (iii) multigraph.

15. (a) Give examples for :

- (i) Tree
- (ii) Binary tree
- (iii) Euler graph.

Or

- (b) Define :

- (i) Walk
- (ii) Path
- (iii) Circuit.

Give examples.

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PART C — (5 × 8 = 40 marks)

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

16. (a) For any three sets A, B, C prove that $A - (B \cup C) = (A - B) \cap (A - C)$.

Or

- (b) Prove the associative laws for union and intersection of any three sets A, B, C .

17. (a) (i) What are functions? Give examples.
(ii) Explain briefly about bijective functions with examples.

Or

- (b) Verify $(h \circ g) \circ f = h \circ (g \circ f)$ where $f : N \rightarrow Z$ given by $f(x) = 3x$, $g : Z \rightarrow R$ given by $g(x) = x^3 + 3$, $h : R \rightarrow R$ given by $h(x) = 5x + 3$.

18. (a) Explain about “conditional and biconditional” statements with their truth tables.

Or

- (b) Write the principal disjunctive normal form and principal conjunctive normal forms of $\neg(p \vee q)$.

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19. (a) Write in detail about various types of graphs with examples.

Or

- (b) A (p, q) graph has t points of degree m and all other points are of degree n . Prove that $(m - n)t + pn = 2q$.
20. (a) Discuss about the properties of a tree in detail.

Or

- (b) Prove that a graph G is connected if and only if for any partition of V into subsets V_1 and V_2 there is a line of G joining a point of V_1 to a point of V_2 .
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