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(6 pages)

Reg. No. :

Code No. : 10482 E Sub. Code : CACA 21

B.C.A. (CBCS) DEGREE EXAMINATION, APRIL 2023.

Second Semester

Computer Applications — Allied

MATHEMATICAL FOUNDATION FOR COMPUTER SCIENCE

(For those who joined in July 2021 onwards)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. For any two sets A and B , $A - B =$ _____.

(a) $(A \cup B) - B$ (b) $(A \cup B) - A$

(c) $(A \cap B) - B$ (d) $(A \cap B) - A$

For any three sets A, B, C

$A \cup B = A \cup C$ and $A \cap B = A \cap C$ implies

(a) $A = B$ (b) $A = C$

(c) $B = C$ (d) $A = B = C$

3. Set of all equivalence classes given an equivalence relation is called _____.

- (a) Partition Set (b) Quotient Set
(c) Closure Set (d) Equivalent Set

4. The function $f: N \rightarrow N$, given by $f(x) = 2x$ is _____.

- (a) one-one but not onto
(b) one-one and onto
(c) neither one-one nor onto
(d) not one-one but onto

5. A compound statement formed by combining two statements using the words "if - then" is _____.

- (a) Tautology (b) Contradiction
(c) Conditional (d) Bi-conditional

6. Which of the following is correct?

- (a) $A \rightarrow (B \vee C) \Leftrightarrow (\neg A \wedge \neg B) \rightarrow C$
(b) $A \rightarrow (B \vee C) \Leftrightarrow (A \wedge \neg B) \rightarrow \neg C$
(c) $A \rightarrow (B \vee \neg C) \Leftrightarrow (A \wedge \neg B) \rightarrow C$
(d) $A \rightarrow (B \vee C) \Leftrightarrow (A \wedge \neg B) \rightarrow C$

7. Graph with only one vertex and no edges is called _____ graph.
- (a) Trivial (b) Pseudo
(c) Null (d) Isolated
8. Two vertices are _____ if they are end vertices of the same edge.
- (a) Disjoint (b) Adjacent
(c) Bipartite (d) Incident
- A connected undirected graph is Eulerian if every graph vertex has _____ degree.
- (a) Even (b) $n-1$
(c) Odd (d) n
9. The number of non-pendant vertices in a binary tree is _____.
- (a) $(n+1)/2$ (b) N
(c) $n/2$ (d) $(n-1)/2$

PART B — (5 × 5 = 25 marks)

Answer ALL questions by choosing (a) or (b).

Each answer should not exceed 250 words.

- (a) Show that $A \cup (B \cap C) = (A \cup B) \cap C$.

Or

- (b) Let $S = \{a, b, c, d, e\}$. Find the equivalence relation induced by the partition $\{\{a, b\}, \{c\}, \{d, e\}\}$.

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12. (a) Give the types of functions.

Or

- (b) If $f: X \rightarrow Y$, $g: Y \rightarrow Z$ and $h: Z \rightarrow S$ are functions, then show that $h \circ (g \circ f) = (h \circ g) \circ f$.

13. (a) What is disjunction? Draw the truth table for disjunction.

Or

- (b) Construct the truth table for $(P \rightarrow Q) \vee (Q \rightarrow P)$.

14. (a) Prove that the number of vertices of odd degree in a graph G is always even.

Or

- (b) Write a note on bipartite graph.

15. (a) What are connected and disconnected graphs?

Or

- (b) Write a note on spanning trees.

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[P.T.O.]

PART C — (5 × 8 = 40 marks)

Answer ALL questions by choosing (a) or (b).

Each answer should not exceed 600 words.

16. (a) Out of 60 students in a class, 25 play Badminton, 20 play Tennis and 30 play Volley ball. 12 play Badminton and Tennis, 9 play Tennis and Volley ball, 13 play Volley ball and Badminton, 5 play all the three games. Find how many of them play (i) None of the game (ii) Only Volley Ball (iii) Only Badminton.

Or

- (b) Prove that $A\Delta(B\Delta C) = (A\Delta B)\Delta C$.

17. (a) Prove that the intersection of any two equivalence relations is an equivalent relation.

Or

- (b) If $f: X \rightarrow Y$ and $g: Y \rightarrow Z$ are bijections, then $(g \circ f)^{-1} = f^{-1} \circ g^{-1}$.

8. (a) Show that

$$P \rightarrow (Q \rightarrow R) \Leftrightarrow P \rightarrow (\neg Q \vee R) \Leftrightarrow (P \wedge Q) \rightarrow R.$$

Or

- (b) Obtain the principal disjunctive and conjunctive normal form for $(P \wedge Q) \vee (\neg P \wedge Q \wedge R)$.

19. (a) Draw Peterson (10, 15) graph.

Or

- (b) Briefly explain adjacency matrix of a graph.

20. (a) What is an Euler graph? Mention its properties.

Or

- (b) Draw a 5-level binary tree with 15 vertices.