

XA (II) – Disc Math (3)

2017-20

Time : 4 hours

Full Marks : 80

Candidates are required to give their answers in their own words as far as practicable.

The questions are of equal value.

Answer any five questions.

1. (a) Define tautology with example.
(b) Show that $((P \vee Q) \wedge \neg(\neg P \wedge (\neg Q \vee \neg R))) \vee (\neg P \wedge \neg Q) \vee (\neg P \wedge \neg R)$ is a tautology.
2. (a) Write P and T rules of inference of predicate calculus.
(b) Show that $R \rightarrow S$ can be derived from the premises $P \rightarrow (Q \rightarrow S)$, $\neg R \vee P$ and Q .
3. (a) Define power set and find $P(A)$ where $A = \{\phi, \{0,1\}\}$

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(1)

(Turn over)

- (b) Prove by method of induction that

$$1 + 2 + 3 + \dots + n = \frac{n(n+1)}{2}$$

4. (a) Define relation matrix and graph of a relation.
(b) Let $X = \{1, 2, 3, 4\}$ and $R = \{(x, y) | x > y\}$. Draw the graph of R and also give its matrix.

5. (a) What do you mean by composition functions?
(b) Let $X = \{1, 2, 3\}$, $Y = \{p, q\}$ and $Z = \{a, b\}$.

Also let $f: X \rightarrow Y$ be $f = \{(1, p), (2, p), (3, q)\}$

and $g: Y \rightarrow Z$ be given by $g = \{(p, b), (q, b)\}$.

Find $g \circ f$.

6. Define group and prove that the set of cube roots of unity forms abelian group with respect to ordinary multiplication. <http://www.biharpaper.com>

7. What do you mean by partially ordered set? Let $X = \{2, 3, 6, 12, 24, 36\}$ and the relation \leq be such that $x \leq y$ if x divides y . Draw the Hass diagram of (X, \leq) .

8. What is Boolean Algebra? Give an example. Use K-map to find a minimal sum of products expression of $f(a, b, c) = \sum(0, 1, 4, 6)$.

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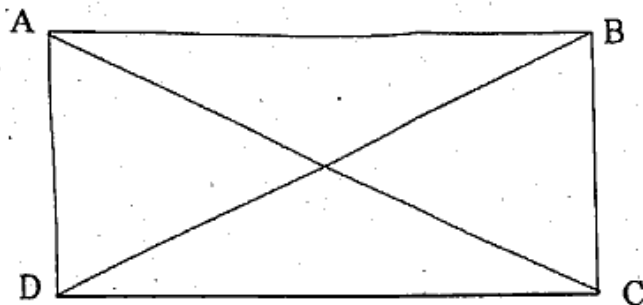
(2)

Contd.

9. (a) Define finite state machine. Give an example.
(b) Define different types of grammars.

10. What do you mean by adjacency matrix of a graph?

Find the adjacency matrix of the following graph.



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