# MODEL QUESTION PAPER

# (SET-III)

WITH ANSWERS OF MULTIPLE-CHOICE QUESTIONS

For

**P.G. (Mathematics) Semester-3**

**Paper: CCMATH307**

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**Section-I**
**(Compulsory)**
**Each part of question carries 1 mark.**

1. Choose the correct answer

(i) Let $(X, \leq)$ be a partially ordered relation where $X = \{2, 3, 6, 12, 24, 36\}$ and $a \leq b$ means "a divides b" then the least element is …

(a) 2.

(b) 3.

(c) 6.

(d) non-existent.

(ii) Which of the following is called associative law?

(a) $a \wedge (a \vee b) = a$
(b) $a \wedge (b \wedge C) = (a \wedge b) \wedge c$
(c) $a \wedge a = a$
(d) $a \wedge b = b \wedge a$.

(iii) Let $(X, \leq)$ be a partially ordered relation where $X = \{1, 2, 3, 6, 9, 18\}$ and $a \leq b$ means "a divides b" then the atoms are …

(a) 1 & 2

(b) 2 & 3

(c) 1, 2 & 3

(d) 2,3 & 6

(iv) If $a$ and $b$ are two elements of a Boolean algebra $B$, then $a + a'.b =$…

(a) $a$.

(b) $b$.

(c) $a + b$

(d) $a' + b$

(v) In a Boolean algebra, which of the following is a conjunctive normal form?

(a) $a + bc + a'bc$

(b) $(a + b + c')(a' + b + c)(a + b + c)$

(c) $ab'c + abc' + a'b'c'$

(d) none of these.

(vi) In a complete graph with $n$ vertices degree of each vertex is…

(a) $n$.

(b) $n-1$.

(c) $\frac{n(n-1)}{2}$.

(d) always odd.

(vii) In a Eulerian path …

(a) every vertex is traversed exactly once.

(b) every edge is traversed exactly once.

(c) every edge and every vertex are traversed exactly once.

(d) degree of every vertex is odd.

(viii) A graph is said to be a simple graph if it has …

(a) no parallel edges.

(b) no self-loop.

(c) no circuit.

(d) no parallel edges or self-loop.

(ix) Which of the following is true for a connected simple planar graph with $n(\geq 3)$ vertices, $e$ edges and $f$ regions?

(a) $3f \leq 2e$

(b) $3f \geq 2e$

(c) $3f \leq e$

(d) none of these.

(x) Out of 1000 words, the minimum number of words whose initial letter is "$C$" is…

(a) 19.

(b) 20.

(c) 39.

(a) 40.

**Section-II**

**Answer any four questions.**

Each question carries 15 marks.

2. Prove that a lattice L is modular lattices if and only if it contains no sublattice isomorphic to pentagonal lattice.

3(a). Define Boolean algebra and prove that for every pair of elements in a Boolean algebra

(i) $(a+b)' = a'.b'$

(ii) $(a.b)' = a' + b'$

(b). Write the function $f = (xy' + xz)' + x'$ in Conjunctive Normal form.

4. In a Boolean algebra $(B, +, *, ', 0, 1)$ state and prove the boundedness laws and associative laws.

5. Define Hamiltonian path and circuit. Prove that if $G$ is graph with $n(\geq 3)$ vertices and if $\deg(u) + \deg(v) \geq n$ for every pair of non-adjacent vertices $u$ & $v$, then $G$ is Hamiltonian.

6. Explain the combinatorial and geometric graph. Also define planar graph and prove that $K_5$ and $K_{3,3}$ are non-planar.

7. State and prove marriage theorem.

8. State principle of inclusion and exclusion and derive the formula for number of derangements of n different objects. Also find the number of ways such that no person picks his own hat if 6 persons randomly arrive at a dark room to retrieve their hats.

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## ANSWER TO OBJECTIVE TYPE QUESTION:

(i) d

(ii) b

(iii) b

(iv) c

(v) b

(vi) b

(vii) b

(viii) d

(ix) a

(x) c