

MODEL QUESTION PAPER

(SET-I)

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 (P, \leq) be a partially ordered set. An element a in P is such that there is no element $b \in P$ satisfying $a \neq b$ and $a \leq b$ then a is called...
 - (a) maximal
 - (b) minimal
 - (c) greatest
 - (d) least
 - (ii) The statement “Least and greatest elements of a partially ordered set (P, \leq) always exist” is ...
 - (a) true
 - (b) false
 - (iii) Which of the following is called idempotent 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) $a \wedge b = b \wedge a$
 - (iv) If a and b are two elements of a Boolean algebra B , then $a + a' \cdot b = \dots$
 - (a) a
 - (b) b
 - (c) $a + b$
 - (d) none of these.
 - (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 graph, the number of vertices with odd degree is...
 - (a) always odd.
 - (b) always even.
 - (c) always an integer multiple of 3.
 - (d) none of these.
 - (vii) A graph is said to be a simple graph if it has ...

- (a) no circuit in it.
 - (b) no parallel edges.
 - (c) no self-loop.
 - (d) no parallel edges or self-loop.
- (viii) A connected graph G is a Euler graph if and only if ...
- (a) every vertex of G is of even degree
 - (b) every vertex of G is of odd degree.
 - (c) exactly two vertices are of odd degree.
 - (d) exactly two vertices are of even degree.
- (ix) In a connected planar graph with n vertices and e edges the number of regions is equal to ...
- (a) $e - n$
 - (b) $n - e$
 - (c) $e - n + 2$
 - (d) $n - e + 2$
- (x) Among 1000 people, the minimum number of people that were born in the same month is ...
- (a) 81
 - (b) 82
 - (c) 83
 - (d) 84

Section-II

Answer any four questions.

Each question carries 15 marks.

- 2(a). Define distributed lattice and complemented lattice. Prove that in a distributed lattice if complement of an element exists then it is unique.
- (b). Define sub-lattice and complete lattice. Also prove that intersection of two sub-lattices is also a sub-lattice whereas union of sub-lattice may not be a sublattice.

- 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 Boolean function $f = (xy' + xz)' + x'$ in Conjunctive Normal form.
- 4(a). Define switch. Discuss the connection of switches in parallel and series and also show that algebra of switches is Boolean algebra.
- (b). Draw the circuit diagram represented by the Boolean function

$$f = (a + b)(cde + (f + g)h)$$
and hence find a circuit which would be open(closed) if and only if above circuit is closed(open).
5. Define Hamiltonian path and circuit. Prove that if G is a 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. Define a tree, spanning tree and minimum spanning tree. Discuss Kruskal's algorithm to find minimum spanning tree with the help of an example,
- 7(a). Define planar graph and show that K_5 & $K_{3,3}$ are non-planar.
- (b). State and prove five colours theorem.
8. Discuss the principle of Inclusion & Exclusion and hence derive the formula to find number of derangements of n 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 QUESTIONS

- (i) a
- (ii) b
- (iii) c
- (iv) c
- (v) b
- (vi) b
- (vii) d
- (viii) a
- (ix) c
- (x) d