

Reg No:.....
Name :.....

K24FY1218

26

First Semester FYUGP Mathematics Examination
NOVEMBER 2024 (2024 Admission onwards)
KU1MDCCMT101 (LOGIC, LATTICES AND BOOLEAN
ALGEBRA)
(DATE OF EXAM: 29-11-2024)

Time : 90 min

Maximum Marks : 50

Part A (Answer any 6 questions. Each carries 2 marks)

1. Give the truth table of $p \wedge q$. 2
2. Define compound and primitive propositions. 2
3. Find the contrapositive of the following statements:
a) If Raju buys vegetables, his mother will prepare him curry.
b) If Mani has casual leave, he goes to his home. 2
4. Rewrite the following statements without using the conditional:
a) If it rains, Raju carries an umbrella.
b) If demand increases, supply increases. 2
5. Find the truth set for the propositional function $p(x)$ defined on the set \mathbb{R} of real numbers if
a) $p(x) = x^2 + 1 = 0$ 2
6. What is the supremum and infimum of the set D_4 of the set of all divisors of 4 ordered by divisibility. 2
7. Define subalgebras and isomorphic Boolean algebras. 2
8. Find the number of literals and number of summands in $E = xy'z + x'z + yz' + x$. 2

Part B (Answer any 4 questions. Each carries 6 marks)

9. Show that $\neg(p \vee q) \vee (\neg p \wedge q) \equiv \neg p$. 6
10. State DeMorgan's laws and verify the same by truth tables. 6
11. Determine the truth value of the following statements if $A = \{1, 2, 3, 4, 5\}$.
a) $\exists x \in A$ such that $x + 3 = 10$.
b) $\forall x \in A, x + 3 < 10$.
c) $\exists x \in A$ such that $x + 3 < 5$. 6
12. Let S be a well ordered set and let $f : S \rightarrow S$ be a similarity mapping of S into S . Prove that for every $a \in S$, we have $a \leq f(a)$. 6

1

13. State idempotent, boundedness, absorption and associative laws in a Boolean algebra. 6
14. Find the consensus Q of P_1 and P_2 where
a) $P_1 = xyz't$ and $P_2 = xy't$.
b) $P_1 = xy'$ and $P_2 = y$.
c) $P_1 = x'yz$ and $P_2 = x'yt$. 6

Part C (Answer any 1 question(s). Each carries 14 marks)

15. a) Show that the set of integers with usual order is linearly ordered but not well ordered.
b) Give an example of an infinite lattice L with finite length. 14
16. Define product order and lexicographical order on the Cartesian product of given ordered sets and illustrate with an example on \mathbb{R}^2 . 14

2