

SASTRA Deemed to be University
First Year – B.Tech Computer Science and Business Systems
Third Continuous Internal Assessment – Jan 2023
MAT133 Discrete Mathematics

Duration: 90 mts

Marks: 50

PART - A

Answer all the questions.

5x2=10 Marks

1. Expand $f(x, y, z) = xy + y\bar{z}$ into canonical sum-of-products form.
2. Write down the minterm normal form of $f(x_1, x_2) = \bar{x}_1 \vee \bar{x}_2$.
3. Prove that every group of prime order is abelian.
4. Give an example of a group which is abelian but not cyclic.
5. If every element of a group is its own inverse, prove that G is abelian.

PART - B

Answer all the questions

2x15=30 Marks

6. (a) Find the conjunctive (sum of products) normal forms the Boolean expression $f(x, y, z) = (yz + xz')(xy' + z)'$ using (i) truth table method and (ii) algebraic method. (8)
- (b) Simplify the following Boolean expression using Boolean algebrax $[y + z(xy + xz)']$. (7)

(OR)

7. (a) Minimize the function
 $f(a, b, c, d) = \sum(0, 2, 6, 7, 8, 9, 13, 15)$, using Karnaugh map method. (7)
- (b) Minimize the function
 $f(a, b, c, d) = \sum(2, 3, 7, 9, 11, 13) + \sum\phi(1, 10, 15)$ by Karnaugh map method. (8)
8. (a) Find the minimum product of sums for the function
 $f(a, b, c, d) = \pi(1, 3, 5, 7, 8, 10, 11, 12, 14)$ by using Karnaugh map method. (7)
- (b) State and prove Lagrange's theorem (8)

(OR)

9. (a) Show that every group of order 4 is abelian. (8)
- (b) Determine the function $f: Z \rightarrow Z$, defined by
 $f(x) = x^2 + 14x - 51$ is an injection and/or a surjection. (7)

PART - C

Answer all the questions

1x10=10 Marks

10. (a) Show that $(Z_n, +_n)$ is an abelian group. (5)
- (b) If R is the relation on the set of positive integers such that $(a, b) \in R$ if and only if ab is a perfect square, show that R is an equivalence relation. (5)