



Roll No:

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

**MCA**  
**(SEM I) THEORY EXAMINATION 2023-24**  
**DISCRETE MATHEMATICS**

**TIME: 3HRS****M.MARKS: 100****Note: 1.** Attempt all Sections. If require any missing data; then choose suitably.**SECTION A****1. Attempt all questions in brief.**

Qno.	Question	Marks
a.	Define the Cartesian Product of sets with example.	2
b.	If set $A$ has $n$ elements, how many relations are there from $A$ to $A$ ?	2
c.	Draw the Hasse diagram of $(D_8, /)$ .	2
d.	Express the following Boolean function in Sum of minterms: $F(x, y, z) = x + y'z$	2
e.	Prove the following Equivalences by using Truth table: $(p \rightarrow q) \rightarrow q \equiv p \vee q$	2
f.	Define Bound and Free variables with example.	2
g.	Define Order of an element of a Group with example	2
h.	What do you mean by Even and Odd Permutation?	2
i.	State the Mathematical Induction Law.	2
j.	Find the minimum number of students in a class so that three of them are born in the same month.	2

**SECTION B****2. Attempt any three of the following:**

a.	Define the composition of function. If $f(x) = x^2 - 1$ and $g(x) = 3x + 1$ , find: i) $gof$ , ii) $fog$ , iii) $gog$ , iv) $fof$	10
b.	IFA = $(a, b, c)$ , show that $(P(A), \subseteq)$ is a Poset and draw its Hasse diagram.	10
c.	Rewrite the following argument using quantifiers, variables and predicate symbols. Prove the validity of the argument: "If it rains then it will be cold. If it is cold then I shall stay at home. Since it rains therefore, I shall stay home".	10
d.	Define the Subgroup. Prove that the additive group of even integers is a subgroup of the additive group of all integers.	10
e.	Prove that: $8^n - 3^n$ is a multiple of 5 for all $n \geq 1$ by mathematical induction.	10

**SECTION C****3. Attempt any one part of the following:**

a.	In a group of 850 person, 600 can speaks Hindi and 340 can speak Tamil. Find :i) How many can speak both Hindi and Tamil? ii) How many can speak Hindi only? iii) How many can speak Tamil only?	10
b.	If $R$ be the relation on set $A = \{a, b, c, d\}$ and $R = \{(a, b), (b, c), (d, c), (d, a), (a, d), (d, d)\}$ . Determine: i) Reflexive closure of $R$ , ii) Symmetric closure of $R$ , iii) Transitive closure of $R$	10

**4. Attempt any one part of the following:**

a.	Express the Boolean expression: $f(x, y, z) = (x'y)'(x + z)$ in both <i>disjunctive and conjunctive normal forms</i> .	10
b.	Use Karnaugh map representation to find minimal sum of products expression for the following Boolean function: $F(A, B, C, ) = \sum(0, 2, 3, 4, 7)$	10

**5. Attempt any one part of the following:**



Roll No:

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

**MCA**  
**(SEM I) THEORY EXAMINATION 2023-24**  
**DISCRETE MATHEMATICS**

TIME: 3HRS

M.MARKS: 100

a.	Prove the following Equivalence: $p \rightarrow (q \vee r) \equiv (p \rightarrow q) \vee (p \rightarrow r)$	10
b.	Obtain the <i>disjunctive normal form(DNF)</i> of the following logical expression: $p \rightarrow ((p \rightarrow q) \wedge \sim (\sim q \vee \sim p))$ .	10
<b>6. Attempt any one part of the following:</b>		
a.	If the Inverse of an element "a" in a group is " $a^{-1}$ ", then the Inverse $a^{-1}$ is a, i.e. $(a^{-1})^{-1} = a$ .	10
b.	Show that the set of fourth roots of unity forms an abelian group with respect to multiplication.	10
<b>7. Attempt any one part of the following:</b>		
a.	Solve the following Recurrence Relation: $a_n - 7a_{n-1} + 10a_{n-2} = 0$ with initial conditions $a_0 = 0$ and $a_1 = 3$	10
b.	What do mean by Generating function. Find the Generating function of the following series: 1,1,1,1,1,1,1.	10

QP24DP2\_290

/ 12-03-2024 08:57:39 | 117.55.242.132