PAPER ID-311200

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 Ahas $n\ elements$, 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.	IF$A = (a,b,c)$, 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 rainstherefore, 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 multipleof 5for all n≥1by 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 $disjunctive\ and\ conjunctive\ normal\ forms$.	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:

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a.	Prove the following Equivalence:$p \rightarrow (q \vee r) \equiv (p \rightarrow q) \vee (p \rightarrow r)$	10
b.	Obtain the $disjunctive\ normal\ form(DNF)$ of the following logical expression:$p \rightarrow ((p \rightarrow q) \wedge \sim (\sim q \vee \sim p)$.	10

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

a.	If the Inverse of an element "a" in a group is "a^{-1}" , then the Inverse $a^{-1}\ is\ a, ie(a^{-1})^{-1} = a.$	10
b.	Show that the set of fourth roots of unity forms an abelian group with respect to multiplication.	10

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

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