

Enroll No.....

Roll No.....

JAMIA HAMDARD**Department of Computer Science & Engineering**

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Even Semester Examination-2023

Paper Name: Discrete Mathematics

Time: 3 Hours

Paper Code: BTCSE-401/BTCSEAI-401

Maximum Marks: 75

Note: Mobile Phones or programmable calculator or any equipment with memory are not allowed inside the examination hall. Follow proper numbering for answering the questions.

Attempt all questions from section A (7*5=35), Any four questions from section B (4*10=40).

Section-A (Attempt all questions 7*5=35)

Q.N.	Questions	Marks	CO	BL
1	Every subgroup of an abelian group is always normal subgroup.	5	CO4	L5
2	Prove by mathematical induction that $6^{n+2} + 7^{2n+1}$ is divisible by 43 for each positive integer n.	5	CO1	L4
3	Which of the following propositions are tautologies: a) $((p \rightarrow q) \rightarrow r) \leftrightarrow ((p \leftrightarrow r) \vee (q \rightarrow r))$ b) $p \wedge (p \wedge r) \leftrightarrow (p \wedge q) \wedge r$	5	CO3	L3
4	Show that the group (a) $\{(1,2,3,4), X_5\}$ and (b) $\{(1,2,3,4,5,6), X_7\}$, is cyclic.	5	CO4	L1
5	In how many ways 11 players can be selected out of 15 players? If (i) One particular player is always selected. (ii) One particular player is never selected. (iii) There is no restriction on selection.	5	CO2	L4
6	Define Subgraphs and explain different kinds of subgraphs. Also explain colouring of graphs.	5	CO5	L1
	Show that the following statement is logically equivalent without using truth table (i) $(P \rightarrow Q) \wedge (P \rightarrow R) \Leftrightarrow P \rightarrow (Q \wedge R)$ (ii) $\sim (P \vee (\sim P \wedge Q)) \Leftrightarrow \sim P \wedge \sim Q$	5	CO3	L5

Section- B (Attempt any four questions 4*10=40Marks)

Q.N.	Questions	Marks	CO	BL
1	(a) Prove that for all a, b in a ring R $(a+b)^2 = a^2 + 2ab + b^2$ if R is commutative. (b) Show that the inverse of the permutation $\begin{pmatrix} 1 & 2 & 3 & 4 \\ 3 & 4 & 1 & 2 \end{pmatrix}$ is an identity permutation.	10	CO4	L5

2	Write an equivalent formula for $p \wedge (q \leftrightarrow r)$ which is free from biconditional as well as conditional.	10	CO3	L4
3	Show that the function f in $A = R - \{2/3\}$ defined as $f(x) = \frac{4x+3}{6x-4}$ is one one and onto. Find f^{-1} .	10	CO4	L5
4	Define a tree. Explain the difference between rooted tree and binary tree.	10	CO5	L1
5	How many people at least in a group of 85 people have the same initials.	10	CO2	L3
6	Show that the relation $R = \{(a,b) : a - b = \text{an even integer}, \forall a, b \in Z\}$ is an equivalence relation.	10	CO1	L3

BL-Bloom's Taxonomy Levels

(1. Remembering, 2. Understanding, 3. Applying, 4. Analysing, 5. Evaluating, 6. Creating.)