Code: 21F00101

MCA I Semester Supplementary Examinations July 2024

MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE

(Master of Computer Applications)

Time: 3 hours | Max. Marks: 60

Answer all the questions

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1	(a)	Explain the following with suitable example: (i) Propositional Equivalence (ii) Nested Quantifiers	6M
	(b)	Explain Rules of Inference with suitable example.	6M
		OR	
2	(a)	What do you mean by propositional logic? Also discuss the application of propositional logic in detail.	6M
	(b)	Illustrate the difference between Predicates and Quantifiers, with suitable example.	6M
3	(a)	Explain the following with suitable example: (i) Closures of Relation (ii) Equivalence Relation (iii) Partial Ordering	6M
	(b)	Explain cardinality of relations with its applications.	6M
		OR	
4	(a)	What are the properties of relation in set theory?	6M
	(b)	Explain n-ary relations and their applications with suitable example.	6M
5	(a)	What do mean by Algorithm? Also discuss the growth of function.	6M
	(b)	What are recursive algorithms and their functions?	6M
		OR	
6	(a)	Explain the following with suitable example: (i) Recursive Definitions (ii) Structural Induction	6M
	(b)	Illustrate the complexity of the algorithm with suitable example.	6M
7	(a)	How to solve time complexity Recurrence Relations using Recursion Tree method?	6M
	(b)	Explain the following with suitable example: (i) Probability Theory (ii) Bayes' Theorem	6M
		OR	
8	(a)	What do you mean by Inclusion-Exclusion? Also discuss the applications of Inclusion-Exclusion.	6M
	(b)	What is the difference between discrete and continuous probability?	6M
9	(a)	What is Graph? Also discuss types of Graph with suitable diagram.	6M
	(b)	Explain Graph Terminology and types of Graphs with suitable example.	6M
		OR	
10	(a)	Illustrate Graph coloring Problem with example.	6M
	(b)	What is the difference between a Hamilton path and Euler path?	6M

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Code: 21F00101

MCA I Semester Regular & Supplementary Examinations February 2024

MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE

(Master of Computer Applications)

Time: 3 hours Max. Marks: 60

Answer all the questions

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1	(a)	What do you mean by propositional logic? Also discuss the application of propositional logic in detail.	6M
	(b)	Explain the following with suitable example: (i) Propositional Equivalence, (ii) Nested Quantifiers.	6M
		OR	
2	(a)	Explain Rules of Inference with suitable example.	6M
	(b)	Illustrate the difference between Predicates and Quantifiers, with suitable example.	6M
3	(a)	Explain n-ary relations and their applications with suitable example.	6M
	(b)	Explain cardinality of relations with its applications.	6M
		OR	
4	(a)	Explain the following with suitable example: (i) Closures of Relation, (ii) Equivalence Relation, (iii) Partial Ordering.	6M
	(b)	What are the properties of relation in set theory?	6M
5	(a)	What do mean by Algorithm? Also discuss the growth of function.	6M
	(b)	Explain the following with suitable example: (i) Recursive Definitions, (ii) Structural Induction.	6M
		OR	
6	(a)	Illustrate the complexity of the algorithm with suitable example.	6M
	(b)	What are recursive algorithms and their functions?	6M
7	(a)	What is the difference between discrete and continuous probability?	6M
	(b)	How to solve time complexity Recurrence Relations using Recursion Tree method?	6M
		OR	
8	(a)	What do you mean by Inclusion-Exclusion? Also discuss the applications of Inclusion-Exclusion.	6M
	(b)	Explain the following with suitable example: (i) Probability Theory, (ii) Bayes' Theorem.	6M
9	(a)	Explain Graph Terminology and types of Graphs with suitable example.	6M
	(b)	Illustrate Graph coloring Problem with example.	6M
		OR	
10	(a)	What is the difference between a Hamilton path and Euler path?	6M
	(b)	What is Graph? Also discuss types of Graph with suitable diagram?	6M

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Code: 21F00101

MCA I Semester Regular & Supplementary Examinations March 2023

MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE

(For students admitted in 2021 & 2022 only)

Time: 3 hours | Max. Marks: 60

Answer all the questions

1	(a)	Construct the truth table of the compound proposition: $(p \vee \neg q) \rightarrow (p \wedge q)$.	6M
	(b)	Use a truth table to verify the distributive law: $p \wedge (q \vee r) = (p \wedge q) \vee (p \wedge r)$.	6M
		OR	
2	(a)	Prove or disprove the validity of the following arguments using the rules of inference: (I) All men are fallible (II) All kings are men (III) Therefore, all kings are fallible.	7M
	(b)	Explain the term universal quantifier with an example.	5M
3	(a)	Let A = {1, 2, 3, 4, 5} and B = {0, 3, 6}. Find: (I) $A \cup B$ (II) $A \cap B$ (III) $A - B$ (IV) $B - A$.	6M
	(b)	If A={1, 2, 3, 4}, B={w, x, y, z} and f={(1, w),(2, x),(3, y),(4, z)} then prove that f is both one-to-one and onto.	6M
		OR	
4	(a)	Explain representation of partially ordered set with suitable example.	6M
	(b)	How many relations are there on a set with 'n' elements? If a set A has 'm' elements and a set B has 'n' elements, how many relations are there from A to B? If a set A = {1, 2}, determine all relations from A to A.	6M
5	(a)	A palindrome is a string that reads the same forward and backward. Describe an algorithm for determining whether a string of *n* characters is a palindrome.	6M
	(b)	Briefly explain Big-Omega and Big-Theta notation.	6M
		OR	
6	(a)	Show that the well-ordering property can be proved when the principle of mathematical induction is taken as an axiom.	6M
	(b)	Give a recursive definition of: (I) The set of even integers. (II) The set of positive integers congruent to 2 modulo 3. (III) The set of positive integers not divisible by 5.	6M
7	(a)	Define finite probability. What is the probability that a card selected at random from a standard deck of 52 cards is an ace?	6M
	(b)	Explain expected value and variance with suitable examples.	6M
		OR	
8	(a)	Discuss different applications of recurrence relations in computer science.	6M
	(b)	Solve the recurrence relation $F_{n+2} = F_{n+1} + F_n$ for $n \geq 0$, given $F_0 = 0$, $F_1 = 1$.	6M
9	(a)	Explain isomorphism of two graphs with suitable example.	6M
	(b)	Discuss in detail about Graph models.	6M
		OR	
10	(a)	Explain the planar Graphs and Hamiltonian graphs with the examples.	6M
	(b)	Write a short note on graph coloring problem with suitable example.	6M
