

2021

B.E. (Computer Science and Engineering)

Third Semester

CS-303: Discrete Structures

Time allowed: 3 Hours

Max. Marks: 50

NOTE: Attempt five questions in all, including Question No. 1 which is compulsory and selecting two questions from each Section.

x-x-x

1. Briefly explain the following:

- (a) Combination with Repetition
- (b) Universal Quantifier
- (c) Pigeon hole principle
- (d) Rings and Fields
- (e) Adjacency matrix

(5x2=10)

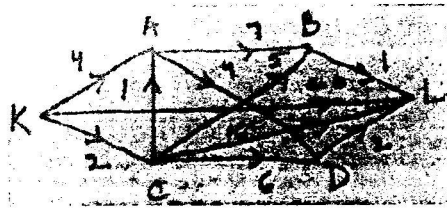
Section-A

2. (a) Consider the universal set $U=\{1,2,3,4,\dots,10\}$ and the subsets $A=\{1,7,8\}$, $B=\{1,6,9,10\}$, $C=\{1,9,10\}$. List the non-empty minsets generated by A, B and C. Do the minsets form a partition of U? (5)
- (b) State the principle of Inclusion and Exclusion. How many integers between 1 and 300 (inclusive) are:
- (i) Divisible by atleast one of 3, 5, 7?
 - (ii) Divisible by 3 and 5, not by 7?
 - (iii) Divisible by 5 but neither by 3 nor by 7? (5)
3. Check the validity of the following arguments using rules of inference of propositional logic without using truth tables:
- (i) On Sundays Mr. Murthy does not read his newspaper or reads 'Readers Digest'. This Sunday he read his newspaper. So, he did not read 'Readers Digest'.
 - (ii) Mary cooks after every rain. John sings whenever Mary cooks. Now, John is singing. Hence, it must have rained. (5x2=10)
4. (a) Let $f: \mathbb{R} \rightarrow \mathbb{R}$ be defined as $f(x) = ax^2 + bx + c$ with $a \neq 0$. Show that f is not onto. (5)
- (b) Define \leq on \mathbb{R}^2 as $(x_1, y_1) \mathbb{R} (x_2, y_2)$ if $x_1 \leq x_2$ and $y_1 \leq y_2$. Show that \leq is a partial order relation. (5)

(2)

Section-B

5. (a) Solve the recurrence relation: $3x_{n+1} - 7x_n + 4x_{n-1} = 3 + 2n$. (5)
(b) Solve $a_{n+1} + 4a_{n-1} = 2^n$ by the method of generating functions. (5)
6. (a) If a graph G has more than two vertices of odd degree, then prove that there can be no Euler path. (5)
(b) Discuss Breadth-First Traversal technique to find a spanning tree using the given graph. (5)



7. (a) Imagine a function that is attended by five ministers including the chief minister. All of them have to be seated on the dias. The ornamental middle seat must go to the chief minister and the remaining four ministers can be seated in any of the remaining four seats. Find the total number of possible seating arrangements. (5)
(b) In how many ways can five letters be chosen from the list A,B,...,I? In how many ways can five letters be chosen if the choice must contain both A and I? (5)

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