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NIST INSTITUTE OF SCIENCE & TECHNOLOGY (Autonomous)

B. Tech/MBA/MCA 4th Semester (2022Batch)				Branch(s)	CSE/IT/CST
Subject Code	19CS4PC04T	Subject Name			Discrete Structure
Time	90 min	Exam	Mid Semester	Max. Marks	50
Examination Superintendent		Prof. Chittaranjan Biswal			
Name of the Instructor(s)		Dr. Deepak Acharya, Dr. Soumitra Choudhury, Dr. Sanjay Sahoo ,Dr. Y. Sankar Rao, Dr. Shasanka Bisoyi, Prof Kali Rath			
Date of Examination		15/04/2024	Sitting	1st	

Answer Question No.1 from PART-I which is compulsory, Four from PART-II and any one from PART-III.

The figures in the right hand margin indicate marks.

Q1.	CO	Level	PART-I (Answer all the questions)	2 x 5
(a)	1	1	What is countable set?	2
(b)	1	2	If $A = \{1, \Phi, 0\}$, then find its power set and what is its cardinality.	2
(c)	1	1	Express the sentence into logical expression using predicate and quantifier "Some students are not success".	2
(d)	2	2	What is compound proposition?	2
(e)	2	2	What is recurrence relation?	2

Q2.	CO	Level	PART-II (Answer four questions)	6 x 4
(a)	1	3	Show that the proposition $(p \wedge \sim q) \vee (p \wedge q)$ is a tautology.	6
(b)	1	3	Determine the disjunctive normal form of $\sim (p \vee q) \Leftrightarrow (p \wedge q)$.	6
(c)	1	1	Prove that the square of even number is an even number by using contrapositive method.	6
(d)	1	2	Find the number of positive integers not exceeding 100 that are divisible either by 4 or by 6.	6

(e)	1	2	Let the universe of discourse of the propositional function P(x) consists of -4, -3, -1, 0, 1, and 3. Express the following statements by using conjunction and disjunction. (i) $\exists x\, P(x)$ (ii) $\forall x((x \neq -1) \to P(x))$ (iii) $\forall x\, P(x)$		6
(f)	1	3	Prove by mathematical induction to show that 3 divides $n^3 + 2n$ where n is a non-negative integer.		6

		CO	Level	PART-III (Answer Any One question)	16 x 1
Q3.	(a)	2	3	(i) Find the generating function of the sequence $a_r = 7^r r$. (ii) Find the numeric function of the generating function $G(x) = \dfrac{3}{1-x}$.	8
	(b)	2	2	Solve the following non-homogeneous recurrence relation $a_{r+2} - 2a_{r-1} + a_r = 3r + 5.$	8
Q4.	(a)	2	2	Using generating function, solve the recurrence relation $a_r = 3a_{r-1} + 2;\ r \geq 2$ with initial condition $a_0 = 1$.	8
	(b)	2	2	Solve the homogeneous recurrence relation $a_r - 5a_{r-1} + 6a_{r-2} = 0,$ where initial conditions are $a_0 = 2\ \&\ a_1 = 5.$	8

*CO1: Student will be able to understand the valid argument by logic.
*CO2: Student will be able to know the application of relation and function.