GALGOTIAS UNIVERSITY

ADMISSION NUMBER

School of Computing Science and Engineering

Bachelor of Technology in Computer Science and Engineering
Mid Term Examination - May 2024

Duration : 90 Minutes
Max Marks : 50

Sem II - C1UC224T - Discrete Mathematics

General Instructions
Answer to the specific question asked
Draw neat, labelled diagrams wherever necessary
Approved data hand books are allowed subject to verification by the Invigilator

1)	Let P(x) be the statement "$x = 2x$." If the domain consists of the integers, what are the truth values of the following? **a)** P(2) **b)** $\exists x P(x)$	K2 (2)
2)	Three cards are chosen one after the other from a 52-card deck. Find the number of ways this can be done: (a) with replacement; (b) without replacement.	K1 (3)
3)	What is the converse, contrapositive, and inverse of the conditional statement "If a positive integer has no divisors other than 1 and itself, then it is prime."	K2 (4)
4)	Let R be a relation on the set $\mathbb{R}$ of real numbers defined by R = $\{(x,y) : \|x - y\| < 1\}$. Show that R is reflexive and symmetric but not transitive.	K2 (6)
5)	How many cards must be selected from a deck of 52 cards to guarantee that at least 5 cards of the same suit are chosen?	K3 (6)
6)	a) Let f and g be the functions $f(x) = \sqrt{x}$ and $g(x) = x^2+1$ Find the composition functions f∘g and g∘f. b) Prove that the function f: $\mathbb{R} \to \mathbb{R}+$ given by $f(x) = e^x$ and g: $\mathbb{R}+ \to \mathbb{R}$ given by $g(x) = \ln(x)$ are inverse of each other.	K3 (9)
7)	Construct a truth table for the compound proposition: $(p \land r) \to (\neg q \lor r)$	K4 (8)
8)	Let *R* be the relation defined on the set Z of integers as follows: for integers a and b, a*R*b if and only if a≡b (mod 4), that is, a*R*b if 4 divides (a-b). 1. Show that R is an equivalence relation on Z. 2. What are the equivalence class containing [0]?	K4 (12)
	OR	
	1. Prove that if n is an odd integer, then n^2 is odd. 2. Prove that $\sqrt{2}$ is irrational by giving a proof by contradiction.	K4 (12)