



United International University (UIU)

Dept. of Computer Science & Engineering (CSE)

Mid Exam. :: Trimester: Summer 2020

Course Code: CSE 2213, Course Title: DISCRETE MATHEMATICS

Total Marks: 20

Duration: 1 hour

Answer all the questions. Figures are in the right-hand margin indicate full marks.

“Any examinee found adopting unfair means will be expelled from the trimester / program as per UIU disciplinary rules.”

Question 1.		
a)	i) Find the power set $P(S)$ for the set $S = \{0, \{\emptyset\}, \emptyset\}$. ii) Draw the Venn Diagram of the following set. $(A \cap C) \cup (A \cap B)$	[1.5×2=3]
b)	For each of the following “functions” f , determine whether they are Bijection. i) $f: Z \rightarrow Z^+, f(x) = x + 1$ ii) $f: Z \rightarrow Z^+, f(a) = \frac{a^3+1}{a^2+1}$	[2×1=2]
Question 2:		
a)	Prove the following using truth table: (i) $(p \rightarrow q) \vee (p \rightarrow r) \equiv p \rightarrow (q \vee r)$	[3]
b)	Given propositions A: X is a good person B: X respects everyone C: X lacks manner Translate the logical expression into a English sentence. $(A \leftrightarrow B) \vee (C \rightarrow \neg A)$	[2]
Question 3:		
a)	$P(x)$: x is attentive. $Q(x)$: x does a good result in the examination. Write down the following sentences using the above predicates, appropriate quantifiers and logical connectives: (i) All attentive students do good result in the examination. (ii) Some students do not do a good result though they are attentive.	[1 x 2 = 2]
b)	With brief explanation, determine the truth values of the following propositions. Here, the domain of each variable consists of all real numbers. (i) $\forall x \exists y (x = y^2)$ (ii) $\exists y \forall x (x = y^2)$ (iii) $\neg \forall x (1 - x = x + 1)$	[1 x 3 = 3] .
Question 4:		
a)	Prove the following by using the principle of mathematical induction, $1^3 + 2^3 + 3^3 + \dots + n^3 = \frac{n^2(n+1)^2}{2}$ whenever n is a nonnegative integer. <i>we are</i>	[3]
b)	Using proof by contraposition, prove the following: “For all integer n , if $n^2 + 5$ is even, then n is odd.”	[2]