CS 3653 – Discrete Mathematics for Computer Science

Assignment # 4	Due – Feb 7, 2022, 11:59pm (CST)
Chapter # 2.1 – 2.2	Max. Points # 25

SN	QUESTION	Pts
1	a) List the members of these sets. i) {x | x is a real number such that $x^2 = 16$} ii) {x | x is a positive integer less than 20} iii) {x | x is the square of an integer and $x < 50$} iv) {x | x is an integer such that $x^2 = 2$} v) {x | x is an odd integer and $x < 10$} b) Use set builder notation to give a description of each of these sets. i) {0, 5, 10, 15, 20, 25} ii) {−2, −1, 0, 1, 2, 3} iii) {a, e, i, o, u}	8 X 0.5
2	a) For each of these pairs of sets, determine whether the first is a subset of the second, the second is a subset of the first, or neither is a subset of the other. i) the set of people who speak English, the set of people who speak English with an Australian accent ii) the set of fruits, the set of citrus fruits iii) the set of students studying discrete mathematics, the set of students studying data structures b) Suppose that A = {2, 4, 6}, B = {2, 6}, C = {4, 6}, and D = {4, 6, 8}. Determine which of these sets are subsets of which other of these sets.	1.5 0.5
3	a) Determine whether these statements are true or false. a) $\emptyset \in \{\emptyset\}$ b) $\emptyset \in \{\emptyset,\{\emptyset\}\}$ c) $\{\emptyset\} \in \{\emptyset\}$ d) $\{\emptyset\} \in \{\{\emptyset\}\}$ e) $\{\emptyset\} \subset \{\emptyset,\{\emptyset\}\}$ f) $\{\{\emptyset\}\} \subset \{\emptyset,\{\emptyset\}\}$ g) $\{\{\emptyset\}\} \subset \{\{\emptyset\},\{\emptyset\}\}$ h) $\{\emptyset\} \subseteq \{\emptyset\}$	8 X 0.5
4	Use a Venn diagram to illustrate: a) the subset of odd integers in the set of all positive integers not exceeding 15. b) the set of all months of the year whose names starts from the letter J in the set of all months of the year.	1 1

5	a) What is the cardinality of each of these sets? i) {a, b} ii) {{a, b}} iii) {a, {a, b}} iv) {a, {a}, {a, b}, {a, {a}, c}} b) Find the power set of each of these sets, where a and b are distinct elements. i) {a, b} ii) {Ø, {Ø}} c) Let A = {a, b, c} and B = {y, z}. Find, i) A × B. ii) B × A.	1 1 1
6	If it is given, U = {0,1,2,3,4,5,6,7,8,9,10}, A = {1,2,3,4,5} and E = {4,5,6,7,8}. Find, i) A ∪ E ii) A ∩ E iii) $\bar{A}$ iv) $\bar{E}$ v) A – E vi) E – A	6 X 0.5
7	Prove the second De Morgan law by showing that if A and B are sets, then $\overline{A \cup B} = \overline{A} \cap \overline{B}$ a) by showing each side is a subset of the other side b) using a membership table	2 X 1
8	Prove by giving a Venn diagram: $\overline{A \cap B} = \overline{A} \cup \overline{B}$	2
9	Let U = {1, 2, 3, 4, 5, 6, 7, 8, 9, 10}. a) What bit strings represent the subset of all odd integers in U? b) What bit strings represent the subset of all even integers in U? c) What bit strings represent the subset of integers not exceeding 5 in U?	3 X 1