

Discrete Structures, Assignment # 1

ECC IV Semester 2014

April 8, 2014

1. Can a set be member of set? For example, $A = \{B\}$, is valid representation, when $A = B$ becomes $A = \{A\}$. Is later logically acceptable? Give you reasoning.
2. What is wrong (if at all) in the following representation, where x and w are arbitrary names of programs: $A = \{x \mid x \text{ checks errors for } w, \text{ when source code of } w \text{ is input for machine code of } x\}$
3. Prove the following through deduction method:
 - (a) $A - B \subseteq A$
 - (b) $A \cap (B - A) = \phi$
 - (c) If $A \subset B$ then $B - (B - A) = A$
 - (d) If $A \subseteq B$, and $B \subseteq C$, show that $A \subseteq C$.
4. List the members of the following sets.
 - (a) $\{x \mid x \text{ is a real number such that } x^2 = 4\}$
 - (b) $\{x \mid x \text{ is an integer such that } x^2 = 2\}$
5. For each of the following sets, determine whether 1 is an element of that set.
 $\{\{1\}, \{\{\{1\}\}\}, \{\{1, 2\}, \{1, \{1\}\}\}, \{\{\{\{1\}\}\}\}$
6. Draw the Venn diagrams for the followings:
 - (a) $A \cap B = A$
 - (b) $A \cup B = A$
 - (c) $A \oplus B = B$
 - (d) $A \cup B = A \cap B$
 - (e) $A - B = A \cap \bar{B}$
7. How many elements are there in each of the following sets:
 - (a) $A = \phi$
 - (b) $B = \{\phi\}$
 - (c) $C = \{\{0, 1\}, \{1, 2\}\}$
 - (d) $D = \{0, 1, 2, \{0, 1\}, \{1, 2\}, \{0, 1, 2\}, A\}$
 - (e) $E = \{0, \{\{1, \{3, 5\}, \{4, 5, 7\}, 8\}\}\}$
8. A language is set of all possible syntactically and semantically correct sentences. Is the English language finite or infinite, given than there is only finite length of sentences in it.
9. Justify that every program is a large integer.

10. Use mathematical Induction to prove the followings:

(a) $1^3 + 3^3 + 5^3 + \dots + (2n - 1)^3 = n^2(2n^2 - 1)$

(b) $3^n + 7^n - 2$ is integer multiple of 8.

11. Show that primes are infinite in numbers.

Note: Submission deadline: 12/04/2014 only, using A4 sheets stapled together.