CS3231 : Tutorial - 6

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Q1 : Explain why the following is not a description of a legitimate Turing machine.
  M = "The input is a polynomial p over variable $x_1, \ldots, x_k$.

1. Try all possible settings of $x_1, \ldots, x_k$ to integer values.

2. Evaluate p on all of these settings.

3. If any of these settings evaluates to 0, accept; otherwise reject."

Q2 : Show that a PDA with 2-stacks is as powerful as a Turing machine.

Q3 : Show that an infinite Turing-recognizable language has an infinite decidable subset.

Q4 : Let A be the language containing only the single string s, where $s = 0$ if 'life will be found on Mars someday' and $s = 1$ if 'life will never be found on Mars'. Is A decidable ?

Q5 : Show that the collection of decidable languages is closed under the operation of 1) union, 2) complementation, 3) concatenation, 4) star, 5) intersection.

Q6 : Show that the collection of recognizable languages is closed under the operation of 1) union, 2) concatenation, 3) star, 4) intersection.

Q7 : Say that a write-once Turing machine is a single-tape TM that can alter each tape square at most once (including the input portion of the tape). Show that this is equivalent to ordinary Turing machine model. (Hint, first show that write-twice model is the same as the ordinary model.)