

## Homework #1

1. Match each of the following compiler functions with the phase that performs it.

- |   |                                     |
|---|-------------------------------------|
| (a) Assigns a variable to register 5            | (i) Lexical Analysis                |
| (b) Identifies <i>loop</i> as a label           | (ii) Syntax Analysis                |
| (c) Changes $A + 4 * 3$ to $A + 12$             | (iii) Semantic Analysis             |
| (d) Finds a variable that has not been declared | (iv) Optimization                   |
| (e) Changes $A := A + 12$ to <i>Add #12, A</i>  | (v) Preparation for Code Generation |
| (f) Creates a parse tree                        | (vi) Code Generation                |

2. (Choose one) The first compilers for high-level languages were produced in the:

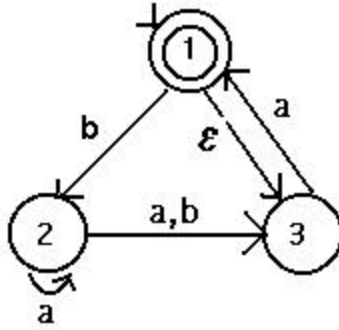
- a) 1930's
- b) 1940's
- c) 1950's
- d) 1960's
- e) 1970's

3. (Choose all correct answers) Parsing is

- a) Approximately linear
- b) Tractable
- c) intractable
- d) NP-Complete

#4. Give a regular expression for an identifier composed of letters, digits, and underscores that begins with a Letter (denote it by L), ends with a letter (L) or digit (denote it by D), and contains no consecutive underscores (denoted by  $\_$ ). You may use ? for optional, \* for 0 or more and + for 1 or more.

5. Consider the following NFA



a) Why is it non-deterministic? (State all reasons you find)

b) Convert the NFA to a DFA.

c) Minimize your dfa from #2.

d) What is  $L(M)$  for all three machines (it should be the same for all three!)