CS 152: Exam-I (April 30, 2021) **Name: _____**

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1. (30 points) Regular Expressions and Grammars

i. Given the following grammar: S → A B | ϵ A → a A | ϵ B → b B | ϵ
Identify the string (if any) that has *multiple leftmost derivations*:
   a) b b b
   b) a a a
   c) ϵ
   d) All of the above

ii. Identify the grammar that is not LL(1) (if any) among the following:
   a) S → (S) S | ϵ
   b) S → a S a | a a | ϵ
   c) S → a A | B B → a B | a
   d) None of the above

iii. Consider the regular expression $(x^* y)?$ x where Σ = {x,y}. Which one of the following strings **can be** generated by the given regular expression.
   a) x x
   b) x x y x
   c) y y x
   d) None of the above

iv. Consider the regular expression [5-7] | [2-4][0-7]. Which one of the following strings **cannot** be generated by the given regular expression.
   a) 6
   b) 26
   c) 40
   d) 520

v. Which one of the following regular expressions is equivalent to the given regular expression: a . c where Σ = {a,c}.
   a) a c
   b) a c | c c
   c) a a c | a c c

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2. **(**30 points) Top Down Parsing. Given the following grammar where STMT is the start symbol:

#1 S → (L) #3 L → S L' #4 L' → ϵ

#2 S → a #5 L' → ; S L'

i. FIRST (L') =

ii. FOLLOW (L) =

iii. TABLE [S, ( ] =

iv. TABLE [S,)] =

v. TABLE [S, a] =

vi. TABLE [L, $] =

vii. TABLE [L, ( ] =

viii. TABLE [L, a] =

ix. TABLE [L', ;] =

x. TABLE [L',)] =

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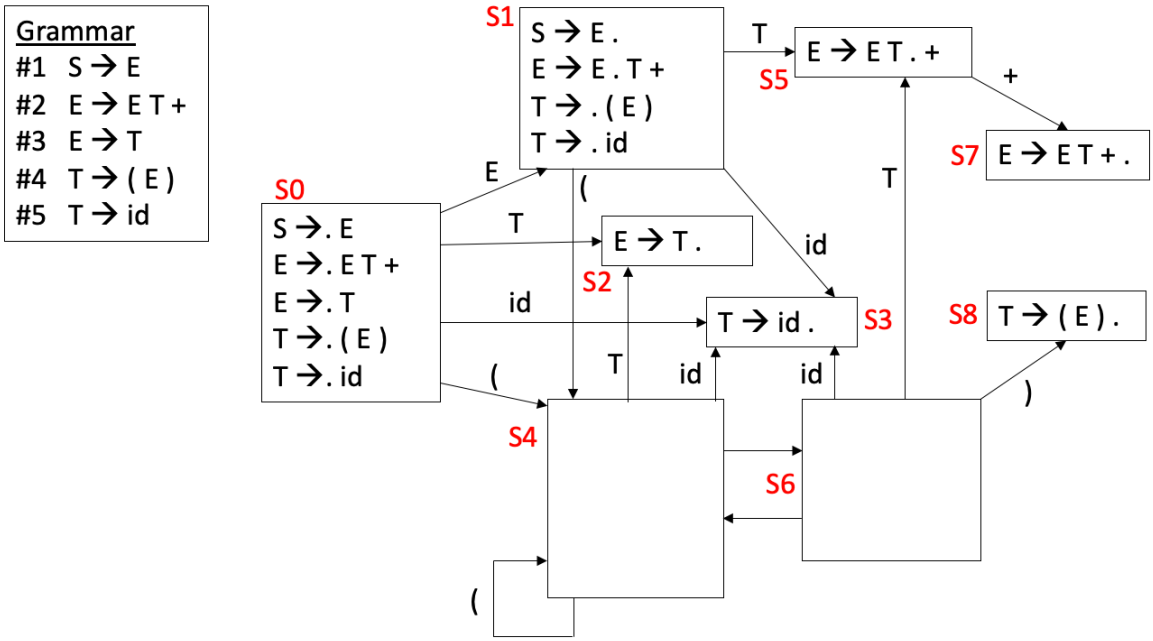
3. (45 points) Bottom Up Parsing: Given an incomplete SLR(1) state machine.



i. Provide *item(s)* for state **S_4** :

ii. Provide *item(s)* for state **S_6** :

iii. Provide *label* for transition **$S_4 \rightarrow S_6$:**

iv. Provide *label* for transition **$S_6 \rightarrow S_4$:**

v. Provide action: **ACTION [S_7, $] =**

vi. Provide action: **ACTION [S_8, +] =**

vii. Provide action: **ACTION [S_2, ( ] =**

viii. Provide action: **ACTION [S_1, id] =**

ix. Are there any shift-reduce conflicts present?