

**CECS 424**  
**Assignment 3**  
**Total: 32 Points**

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General Instruction

- I recommend that you type your answers to exercise questions by using a word processor (Microsoft word, LibreOffice writer, L<sup>A</sup>T<sub>E</sub>X, etc.).
  - Submit a PDF file via BeachBoard (Not email or in class).
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1. (14 points) Chapter 2.6 – Exercise 2.4 (a) and (b).
2. (8 points) Show the left-most parse tree for the string `a b a a`.

Terminal symbols: {a, b}  
S → A M  
M → S |  $\epsilon$   
A → a E | b A A  
E → a B | b A |  $\epsilon$   
B → b E | a B B

3. (10 points) Construct a parse tree for the input string `foo(a,b)`.

Terminal symbols: {id, =, +, -, \*, ' ', (, ),  $\epsilon$ }  
stmt → assignment | subr\_call  
assignment → id = expr  
subr\_call → id ( arg\_list )  
expr → primary expr\_tail  
expr\_tail → op expr |  $\epsilon$   
primary → id | subr\_call | ( expr )  
op → + | - | \* | /  
arg\_list → expr args\_tail  
args\_tail → , arg\_list |  $\epsilon$