

Homework quiz 11

Due Apr 23 at 11:59pm

Points 10

Questions 7

Available until Apr 23 at 11:59pm

Time Limit None

Allowed Attempts Unlimited

Instructions

This "quiz" is your graded homework for the week. Some of it can be done based solely on the materials found on Canvas, while other parts may require lecture material.

I suggest you consume the Canvas material as early as possible and attempt as many problems as you can, and then return to finish after lecture and/or office hours fills in any gaps in your understanding.

You are welcome to take the quiz alone or with others. If you do work with others, it is important that answers are not simply shared but that everyone involved works to understand the solution and could do similar problems alone in the future.

The quiz is untimed and may be taken multiple times. Your highest score achieved before the deadline is the one that will get recorded.

Take the Quiz Again

Attempt History

	Attempt	Time	Score
KEPT	Attempt 8	3 minutes	10 out of 10
LATEST	Attempt 8	3 minutes	10 out of 10
	Attempt 7	9 minutes	9.5 out of 10
	Attempt 6	11 minutes	9.75 out of 10
	Attempt 5	1,058 minutes	9 out of 10

Attempt	Time	Score
Attempt 4	20 minutes	9.5 out of 10
Attempt 3	26 minutes	7.5 out of 10
Attempt 2	26 minutes	6.45 out of 10
Attempt 1	1,753 minutes	2.7 out of 10

❗ Correct answers are hidden.

Score for this attempt: **10** out of 10

Submitted Apr 19 at 12:14pm

This attempt took 3 minutes.

Question 1

0.5 / 0.5 pts

Consider the context-free grammar

$S \rightarrow ASA \mid A$

$A \rightarrow aA \mid ab$

When following the CFG-to-PDA conversion process learned in class, there is only one state in the resulting PDA that has a self-loop.

How many PDA triples are there on this self-loop?

Question 2**0.5 / 0.5 pts**

Consider the context-free grammar

$$S \rightarrow ASA \mid A$$
$$A \rightarrow aA \mid ab$$

When following the CFG-to-PDA conversion process learned in class, there is only one state in the resulting PDA that has a self-loop.

Of all the PDA triples on this self-loop, write the longest one in the box below (if there is more than one longest, write any of them).

Do not write any spaces. If you need a lambda or empty stack symbol, write exactly "lambda" or "emptystack" in its place. For this problem, the length of a triple is the number of characters in the triple when written down on paper, so a,b,emptystack is five characters long (including the commas).

lambda,S,ASA

Question 3**0.5 / 0.5 pts**

Consider the context-free grammar

$$S \rightarrow ASA \mid A$$
$$A \rightarrow aA \mid ab$$

When following the CFG-to-PDA conversion process learned in class, there is only one state in the resulting PDA that has a self-loop.

Of all the PDA triples on this self-loop, write the shortest one that contains an "a" or a "b" anywhere in the triple in the box below (if there is more than one shortest, write any of them).

Do not write any spaces. If you need a lambda or empty stack symbol, write exactly "lambda" or "emptystack" in its place. For this problem, the length of a triple is the number of characters in the triple when written down on paper, so a,b,emptystack is five characters long (including the commas).

a,a,lambda

Question 4

1.5 / 1.5 pts

Assuming you already know A is nullable and B is not nullable, which of the following set constraints can be deduced from the following set of productions?

$S \rightarrow ABS \mid \lambda$

Check all that apply. Note: Canvas scores this kind of problem proportional to (# of correct checked boxes) - (# of incorrect checked boxes).

☒ $\text{First}(A) \subseteq \text{First}(S)$

☒ $\text{First}(B) \subseteq \text{First}(S)$

☒ $\text{First}(B) \subseteq \text{Follow}(A)$

☐ $\text{First}(S) \subseteq \text{Follow}(A)$

☒ $\text{First}(S) \subseteq \text{Follow}(B)$

☐ $\text{Follow}(B) \subseteq \text{Follow}(S)$

☒ $\text{Follow}(S) \subseteq \text{Follow}(B)$

☐ $\text{Follow}(A) \subseteq \text{Follow}(S)$

☐ $\text{Follow}(S) \subseteq \text{Follow}(A)$

Question 5

2 / 2 pts

Consider the context-free grammar

$A \rightarrow aA \mid B \mid \lambda$

$B \rightarrow bB \mid cA$

You may assume A is the start symbol and so $\$$ is in $\text{Follow}(A)$. In each of the following questions list your set in alphabetical order with $\$$ at the end of the list if it's included. If a set is empty write exactly the word empty. Separate items using commas and no spaces. For example: $x,y,\$$

What is in $\text{First}(A)$? { }

What is in $\text{First}(B)$? { }

What is in Follow(A)? { }

What is in Follow(B)? { }

Answer 1:

a,b,c

Answer 2:

b,c

Answer 3:

\$

Answer 4:

\$

Question 6

2.5 / 2.5 pts

Consider the context-free grammar below that generates mathematical expressions (it uses "a" as a placeholder for where values would go).

$S \rightarrow BA$

$A \rightarrow +BA \mid -BA \mid \lambda$

$B \rightarrow DC$

$C \rightarrow *DC \mid /DC \mid \lambda$

$D \rightarrow a \mid (S)$

You may assume S is the start symbol and so $\$$ is in $\text{Follow}(S)$. The non-terminals in this grammar are S, A, B, C , and D . The terminals are $a, +, -, *, /, (,)$, and $\$$. For grading purposes, list terminals in your answers in the following order: $a+*/()\$$

In each of the following questions list your set in the order given above. If a set is empty write exactly the word empty. Separate items using commas and no spaces. For example: $a,-,/,)$

What is in $\text{First}(S)$? { }

What is in $\text{First}(A)$? { }

What is in $\text{First}(B)$? { }

What is in $\text{First}(C)$? { }

What is in $\text{First}(D)$? { }

What is in $\text{Follow}(S)$? { }

What is in $\text{Follow}(A)$? { }

What is in $\text{Follow}(B)$? { }

What is in $\text{Follow}(C)$? { }

What is in Follow(D)? { }

Answer 1:

a,(

Answer 2:

+,-

Answer 3:

a,(

Answer 4:

*,/

Answer 5:

a,(

Answer 6:

),,\$

Answer 7:

),,\$

Answer 8:

+,-,),\$

Answer 9:

$+, -,), \$$

Answer 10:

$+, -, *, /,), \$$

Question 7

2.5 / 2.5 pts

Consider the context-free grammar below that generates mathematical expressions (it uses "a" as a placeholder for where values would go).

$S \rightarrow BA$

$A \rightarrow +BA \mid -BA \mid \lambda$

$B \rightarrow DC$

$C \rightarrow *DC \mid /DC \mid \lambda$

$D \rightarrow a \mid (S)$

You may assume S is the start symbol and so $\$$ is in $\text{Follow}(S)$. The non-terminals in this grammar are S, A, B, C , and D . The terminals are $a, +, -, *, /, (,),$ and $\$$. For grading purposes, list terminals in your answers in the following order: $a+*/()\$$

For each production, list which next input symbol would predict the production (assuming that the production's left-hand side is on the top of the parsing stack). You should find your answer by building a prediction table as seen in class. In each answer list your set in the order given above. If a set is empty write exactly the word empty. Separate items using commas and no spaces. For example: $a, -, /,)$

$S \rightarrow BA \{ a, ($ $\}$

$A \rightarrow +BA$ {

$A \rightarrow -BA$ {

$A \rightarrow \lambda$ { }

$B \rightarrow DC$ {

$C \rightarrow *DC$ { }

$C \rightarrow /DC$ { }

$C \rightarrow \lambda$ { }

$D \rightarrow a$ { }

$D \rightarrow (S)$ { }

Answer 1:

a,(

Answer 2:

+

Answer 3:

-

Answer 4:

),\$

Answer 5:

a,(

Answer 6:

*

Answer 7:

/

Answer 8:

+,-),\$

Answer 9:

a

Answer 10:

(

Quiz Score: **10** out of 10