Compilers & Programming Languages
SOFE 3960U
Assignment #2
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(A1)
New Grammar

```
prog       : stmt-list
stmt-list  : stmt A
A          : stmt-list | ε
stmt       : PRINT expr | PRINT string
string     : BEGINQUOTE charlist ENDQUOTE
charlist   : LETTER charlist | ε
expr       : term C
C          : + term C | - term C | ε
term       : factor D
D          : * factor D | / factor D | ε
factor     : ( expr ) | NUM
```

(A2)
Left factored grammar

```
prog      : stmt-list
stmt-list : stmt A
A         : stmt-list | ε
stmt      : PRINT B
B         : expr | string
string    : BEGINQUOTE charlist ENDQUOTE
charlist  : LETTER charlist | ε
expr      : term C
C         : + term C | - term C | ε
term      : factor D
D         : * factor D | / factor D | ε
factor    : ( expr ) | NUM
```

(A3)
First Sets

First(prog) = {PRINT}
First(stmt-list) = {PRINT}
First(A) = {PRINT}
First(stmt) = {PRINT}
First(B) = {(,BEGINQUOTE,NUM}
First(string) = {BEGINQUOTE}
First(charlist) = {LETTER, ε}
First(expr) = {(, NUM}
First(C) = {+,-,ε}
First(term) = {(,NUM}
First(D) = {*,/,ε}
First(factor) = {(,NUM}

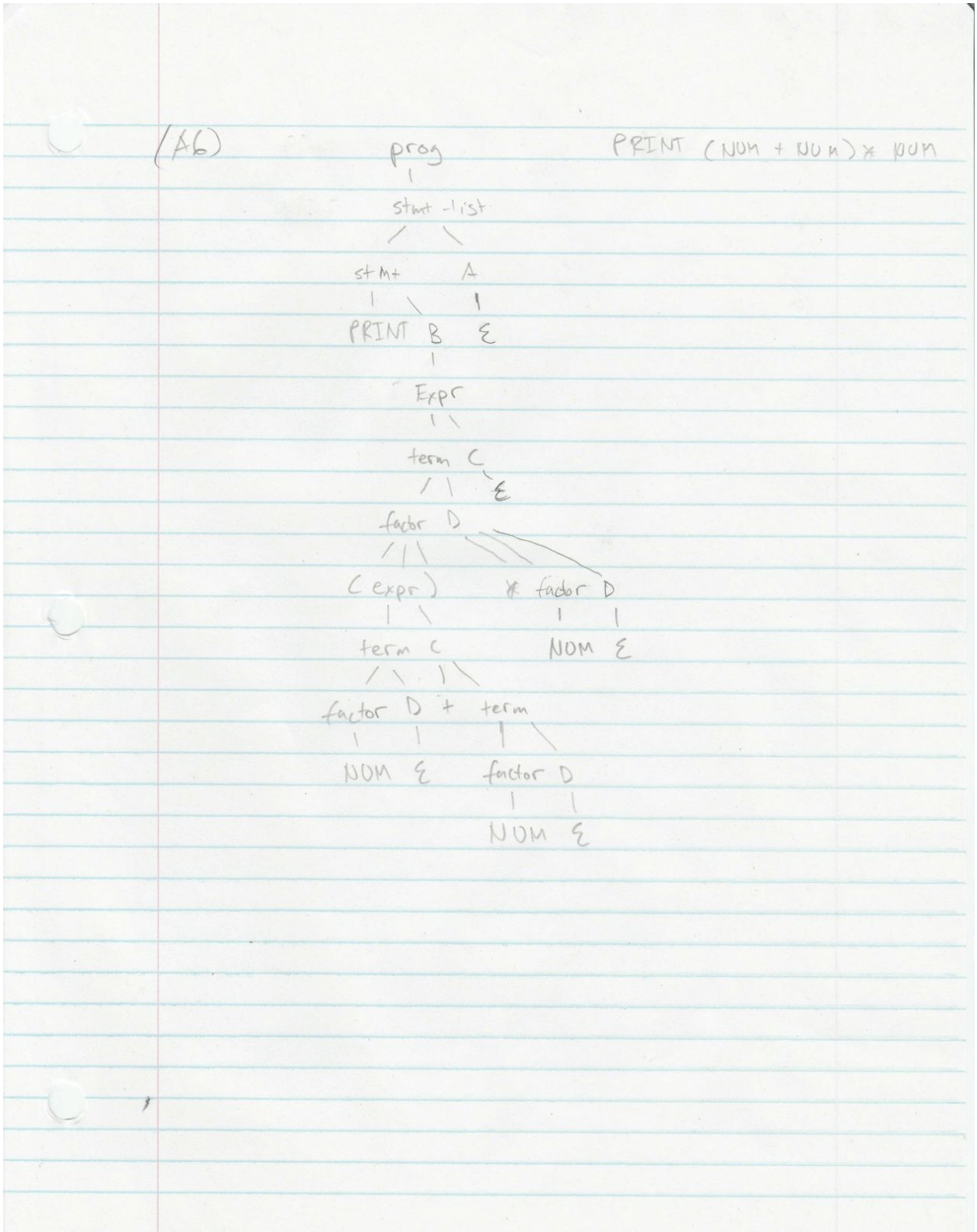
(A4)
Follow Sets

Follow(prog) = {$}
Follow(stmt-list) = {$}
Follow(A)) = {$}
Follow(stmt) = {PRINT,$}
Follow(B) = {PRINT,$}
Follow(string) = {PRINT,$}
Follow(charlist) = {ENDQUOTE}
Follow(expr) = {PRINT,$,)}
Follow(C) = {PRINT,$,)}
Follow(term) = {+,-,PRINT,$,)}
Follow(D) = {+,-,PRINT,$,)}
Follow(factor) = {+,-,*,/,),PRINT,$}

(A5)

Non-Terminal Symbol	Input Symbol											
	PRINT	BEGINQUOTE	ENDQUOTE	LETTER	+	-	*	/	(	)	NUM	$
prog	stmt-list											
stmt-list	stmt A											
A	stmt-list											ε
stmt	PRINT B											
B		string							expr		expr	
string		BEGINQUOTE charlist ENDQUOTE										
charlist			ε	LETTER charlist								
expr									term C		term C	
C	ε				+ term C	- term C				ε		ε
term									factor D		factor D	
D	ε				ε	ε	* factor D	/ factor D		ε		ε
factor									(expr)		NUM	

(A6)


(A6)
prog
PRINT (NUM + NUM) * NUM
stmt-list
stmt
A
PRINT B
ε
Expr
term C
ε
factor D
(expr)
* factor D
term C
NUM ε
factor D + term
NUM ε
factor D
NUM ε