National University of Computer and Emerging Sciences, Lahore Campus

	Course:	Compiler Construction	Course Code:	
	Program:	BS (Computer Science)	Semester:	Fall 2017
	Duration:	60 Minutes	Total Marks:	35
	Paper Date:	4-Nov-2017	Weight	
	Section:	N/A	Page(s):	1
	Exam:	Second Session Exam	Reg. No.	
Instruction/Notes:	Solve question 1 on pages 1 and 2, and question 2 on pages 3 and 4.			

Q1 (5+5+10)

Consider a file containing marks of the students as follows:

```
Ahsan : 50 ; 60 ; 70
Yasir : 60 ; 70 ; 80
...
```

The first column is for Math, second for Physics, and third for chemistry. Following is a CFG to capture this data:

```
L -> L R | ^
R -> str : M
M -> num ; num ; num
```

Now answer the following questions:

a) Give a parse tree for the above CFG and the two lines of input.
b) Add (semantic) actions into the above CFG to compute total marks for each student. Your translation scheme shall print name of each student along with the total marks obtained.
c) Add actions to compute average marks for each subject. Your translation scheme shall print name of each subject along with the class average for that particular subject.

Q2 (10+5)

Consider the following translation scheme:

```
S -> T      {print(T.v)}
T -> T1 R   {T.v = max(T1.v, R.v)}
T -> &&     {T.v = -1}
R -> R1 C   {R.v = R1.v + C.v}
R -> #      {R.v = 0}
C -> num    {C.v = toInt(num.lex)}
```

a) Remove left recursion from the above translation scheme. Your final answer shall be a complete independent translation scheme including all the required productions.
b) What does the above translation scheme compute? Write only one or two sentences.