	Course Name:	Compiler Construction	Course Code:	CS-402
	Program:	BS (CS)	Semester:	Spring 2018
	Duration:	60 Minutes	Total Marks:	25
	Paper Date:	14-Apr-2018	Weight	
	Section:	ALL	Page(s):	2
	Exam Type:	Midterm-II		

Student : Name:_____ Roll No._____ Section:_____

Instruction/Notes: Solve question 1 on page 1, question 2 on page 2, and question 3 on page 3.
Only the first three pages will be marked!

Question 1 (5 marks)

Give three-address code for the following C++ program:

```
cin >> marks;

if (marks >= 80)
     grade = 'A';
else if (marks >= 60)
     grade = 'B';
else
     grade = 'C';

cout << grade;
```

Question 2 (10 marks)

Remove left recursion from the following translation scheme:

```
S -> C          {print("#count:"+C.n + "\n$count:"+C.d)}
C -> C1 # str   {C.n = C1.n + 1; C.d = C1.d}
C -> C1 $ str   {C.n = C1.n; C.d = C1.d + 1}
C -> # str      {C.n = 1; C.d = 0}
C -> $ str      {C.n = 0; C.d = 1}
```

Do not use global variables!

Question 3 (10 marks)

Consider the following grammar for C structures:

```
S -> struct id { L };
L -> L D | ^
D -> T id ;
T -> int | char | id
```

The size of such a C structure is equal to the sum of all the variables declared within it. Consider the following structures for example:

```
struct Time {
     int hour;
     int min;
     int sec;
};

struct ClassTime {
     int courseCode;
     Time start;
     Time end;
};
```

Assuming size of the integer as 4 bytes, the size of the structure Time is 12 bytes, and the size of ClassTime is 28 bytes.

Your task is to add semantic actions into the afore-mentioned grammar, to compute size of the structure. Again, you cannot use global attributes!