STRUCTURE

It is a user defined data type.

It is a complex data type.

It is collection of heterogeneous variables.

Structure is a user defined, complex data type where we can store and manage more than one variable of different data types under one name.

Structure allows to store both primitive and derived data types (arrays, pointers) at one place, under one name.

In real time applications, data is stored in the form of objects. In this situation, we need structures. Structures are the foundation for object oriented.

Primitive and derived data types are designed to work with basic data types like int, float and char.

Primitive and derived data types don’t support real time requirements. Hence we have to use the user defined data type structure.

Structure allows to carry different types of variables at a time.

When structure address is available, automatically all the variables address also available. Due to this search time is reduced.

Structure allows to store information in the form of records.

In data files we are using structures very much.

Syntax:

```
struct   [ <structure-tag-name> ]
{
datatype    variable;
                          structure members
datatype    variable;
}
```

[structure_variables] ;

Here struct is a keyword.

Structure tag name is used to identify the structure and it is optional, but required when structure variables declared in other places of the program.

The variables that are declared inside a structure are called **structure members**.

Structure size is sum of all the structure members datatype size.

Without structure members [empty] structure size is **1 byte.**

Structure variables are the **instances** [**copies**] of the structure.

Structure is a blue-print [original copy] to create the structure variables.

Structure variable is the physical representation of a structure.

When structure variables declared then only memory allocated for structure members.

Every structure should be end with ;

To access the structure members we should have to use the following syntax.

```
structurevariable.structuremember;
```

It is called calling / accessing / invoking the structure members.

Here **.** (dot) operator is called

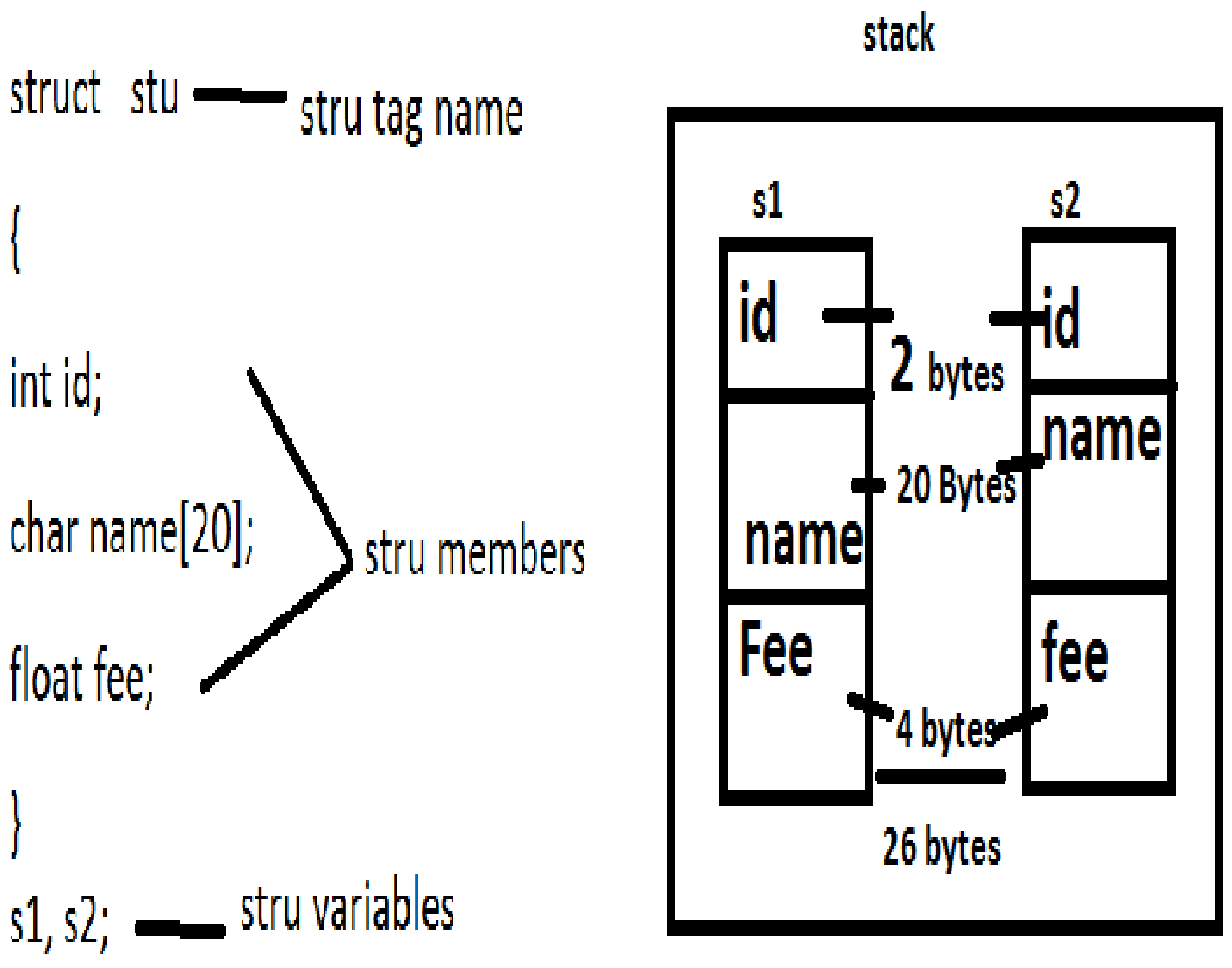
- ➢ Member access operator
- ➢ Field access operator
- ➢ Member of operator
- ➢ Membership operator
- ➢ Belongs to operator

We can declare structure variables in other places of the program by using below syntax.

struct structure-tag-name structure-variables;

Eg: struct stu s1, s2;

Memory allocation for structure variables

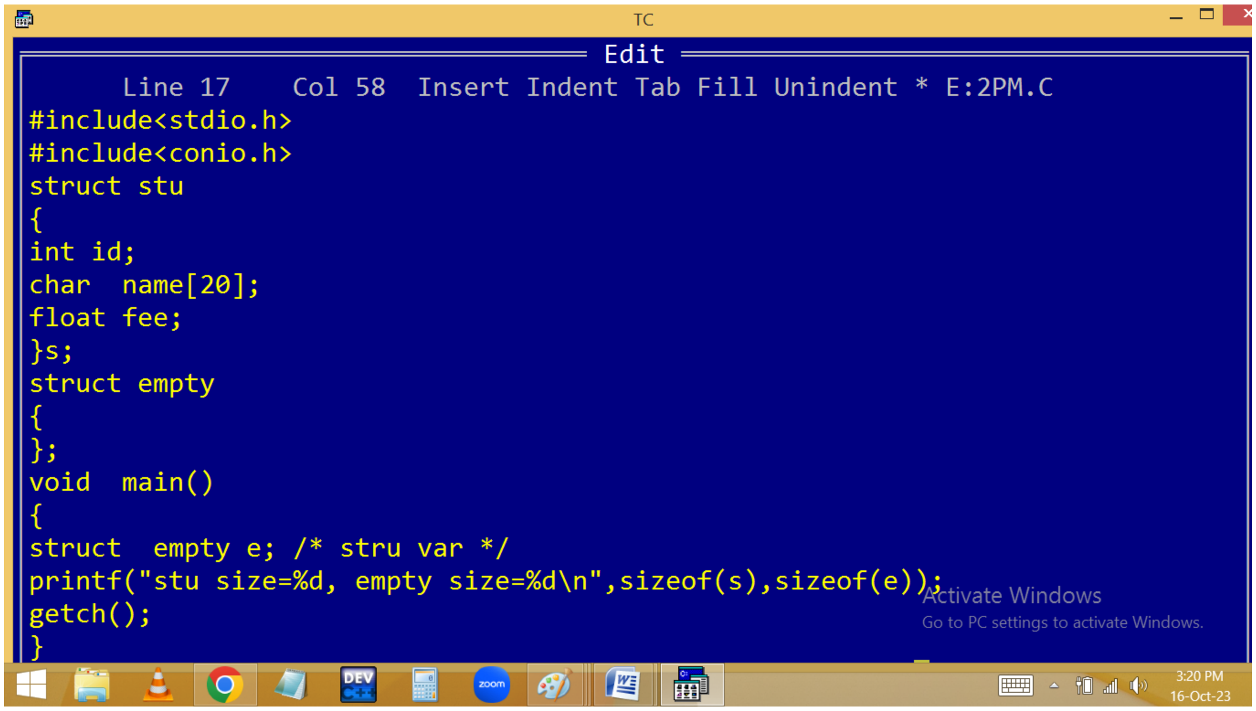


```
struct   stu
{
int id;
char name[20];
float fee;
}
s1, s2;
```

s1.id=100;/* calling structure member*/

```
s2.id=200;
```

Finding structure size: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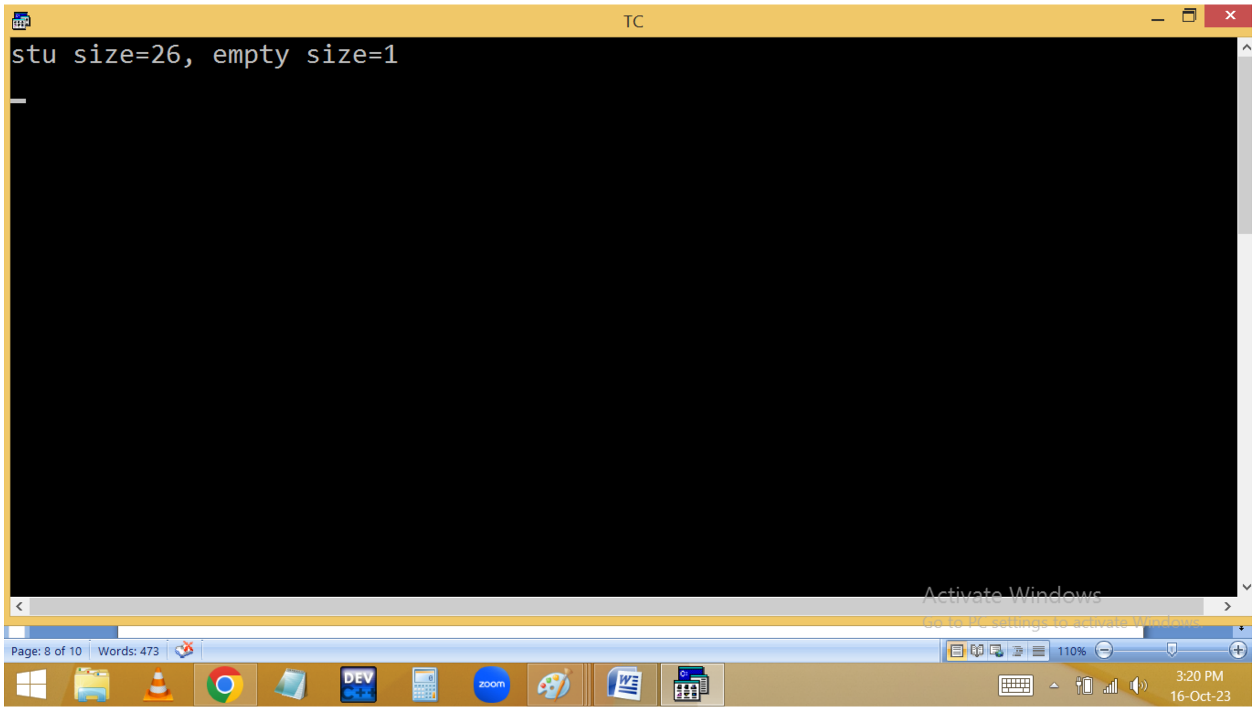
```
#include<stdio.h>
#include<conio.h>
struct stu
{
int id;
char  name[20];
float fee;
}s;
struct empty
{
};
void  main()
{
struct  empty e; /* stru var */
printf("stu size=%d, empty size=%d\n",sizeof(s),sizeof(e));
getch();
}
```



```
stu size=26, empty size=1
```

Eg: Direct initialization of structure members:

It is the process of passing values for structure members, without using scanf() at design time using =.

Note: In direct initialization of structure members, the passing values datatype and structure members datatype should be matched.

When all the structure members are not initialized, they will store the default values as follows.

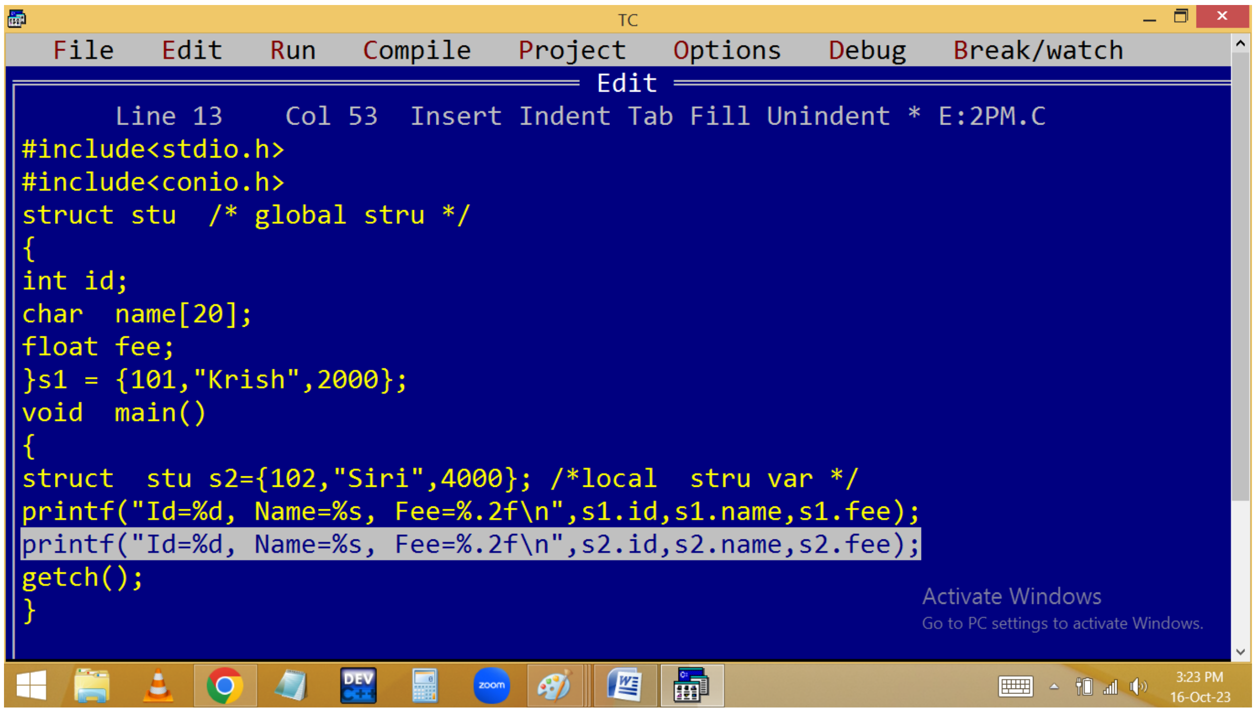
Int – 0

Float – 0.000000

Char – blank space

structures stores 0, 0.00 and blank in int, float and char.

when it is a local structure, without initialization, stores garbage values.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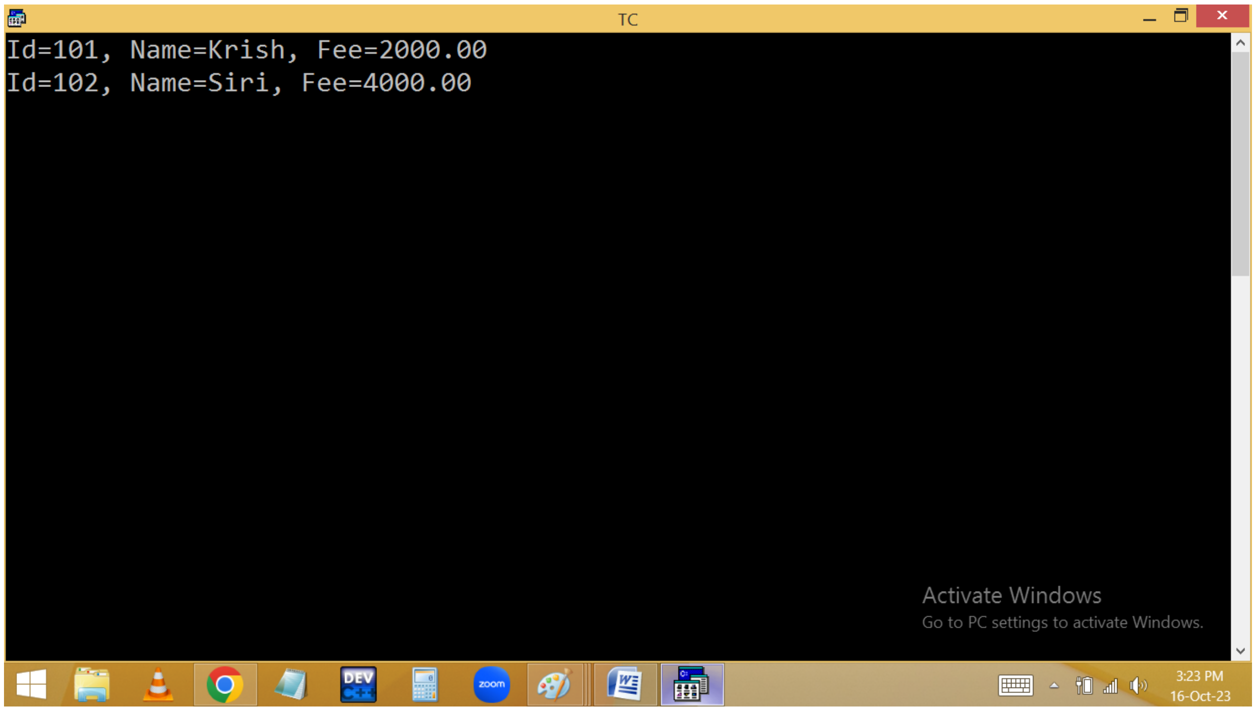
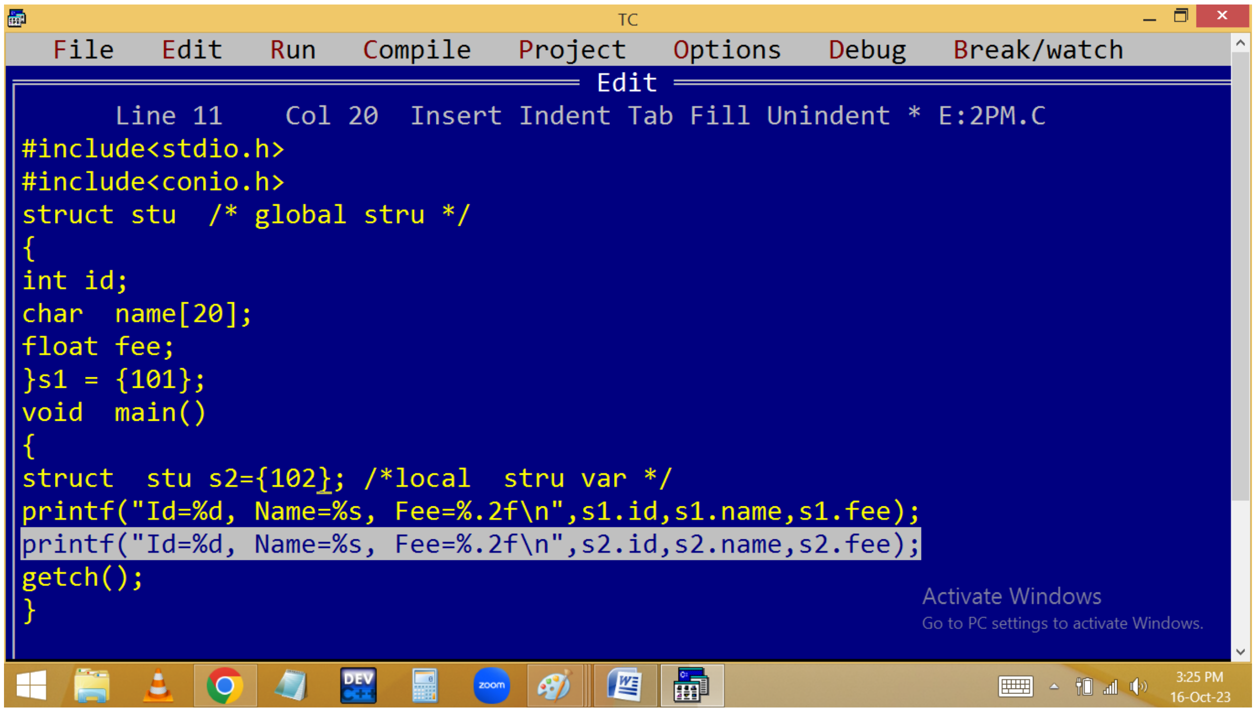
```
#include<stdio.h>
#include<conio.h>
struct stu  /* global stru */
{
int id;
char  name[20];
float fee;
}s1 = {101,"Krish",2000};
void  main()
{
struct  stu s2={102,"Siri",4000}; /*local  stru var */
printf("Id=%d, Name=%s, Fee=%.2f\n",s1.id,s1.name,s1.fee);
printf("Id=%d, Name=%s, Fee=%.2f\n",s2.id,s2.name,s2.fee);
getch();
}
```



```
Id=101, Name=Krish, Fee=2000.00
Id=102, Name=Siri, Fee=4000.00
```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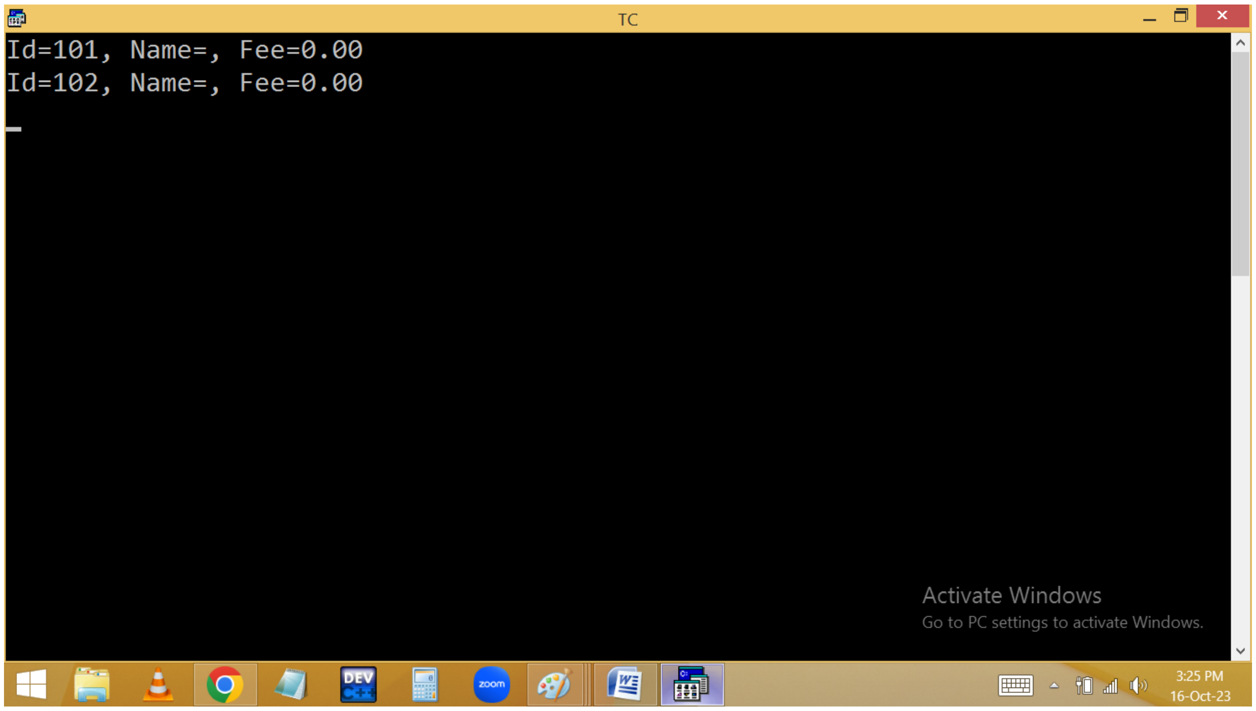
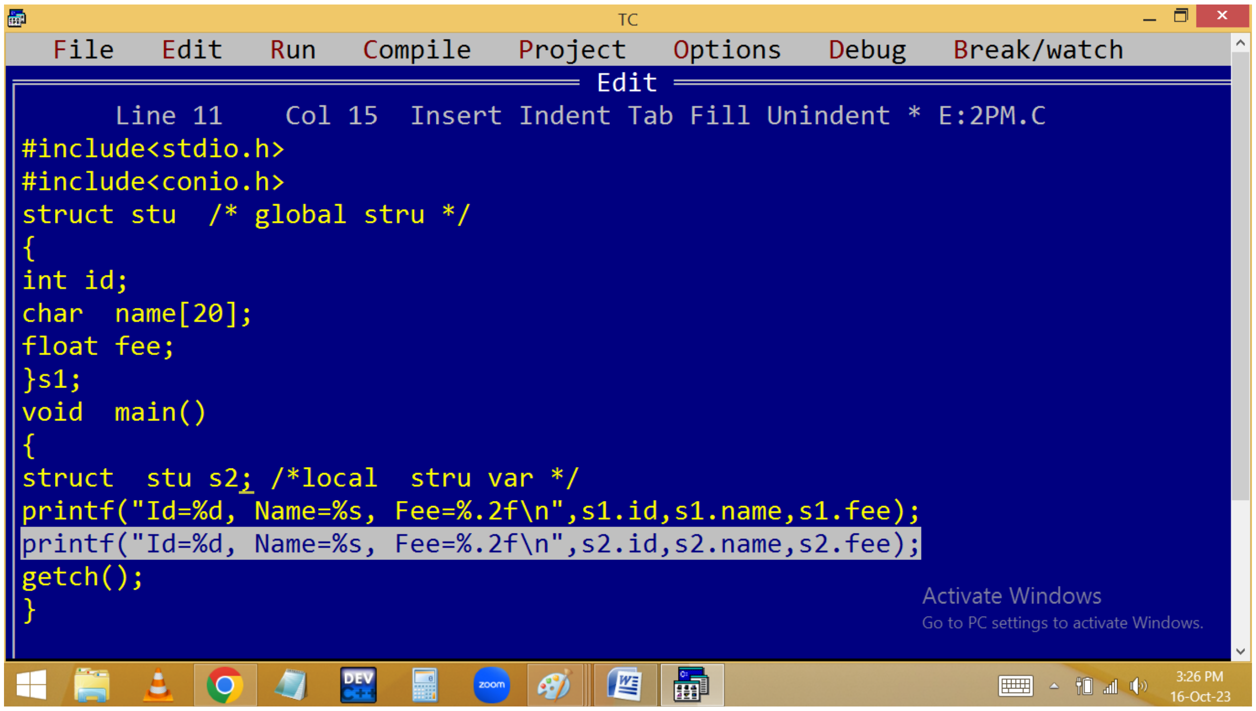
```
#include<stdio.h>
#include<conio.h>
struct stu  /* global stru */
{
int id;
char  name[20];
float fee;
}s1 = {101};
void  main()
{
struct  stu s2={102}; /*local  stru var */
printf("Id=%d, Name=%s, Fee=%.2f\n",s1.id,s1.name,s1.fee);
printf("Id=%d, Name=%s, Fee=%.2f\n",s2.id,s2.name,s2.fee);
getch();
}
```



```
Id=101, Name=, Fee=0.00
Id=102, Name=, Fee=0.00
```



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```
#include<stdio.h>
#include<conio.h>
struct stu  /* global stru */
{
int id;
char  name[20];
float fee;
}s1;
void  main()
{
struct  stu s2; /*local  stru var */
printf("Id=%d, Name=%s, Fee=%.2f\n",s1.id,s1.name,s1.fee);
printf("Id=%d, Name=%s, Fee=%.2f\n",s2.id,s2.name,s2.fee);
getch();
}
```

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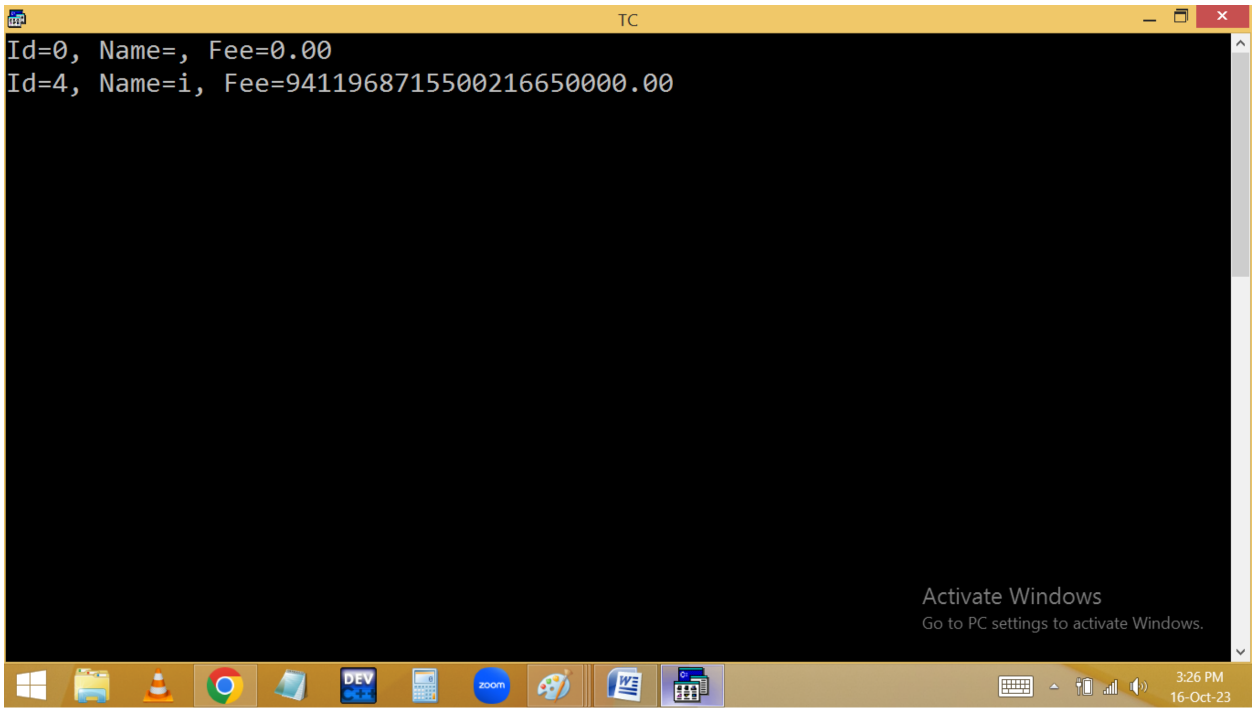
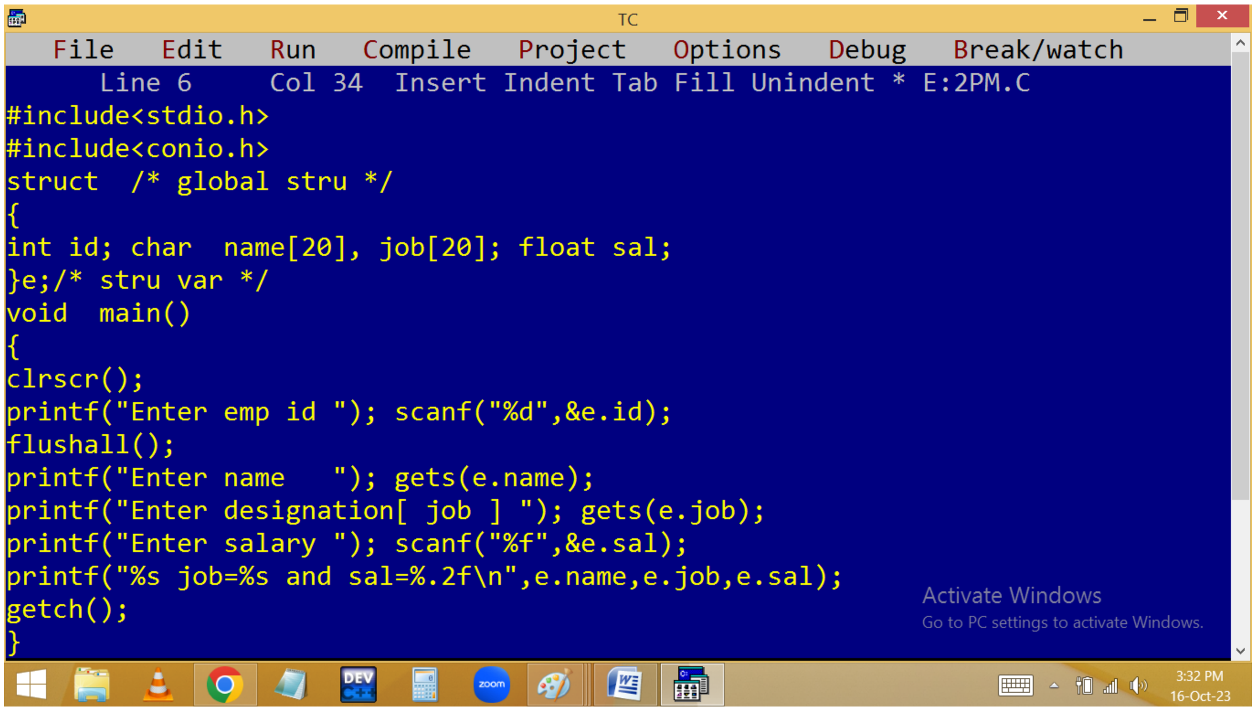


```
Id=0, Name=, Fee=0.00
Id=4, Name=i, Fee=94119687155002166500000.00
```

Reading and printing structure data: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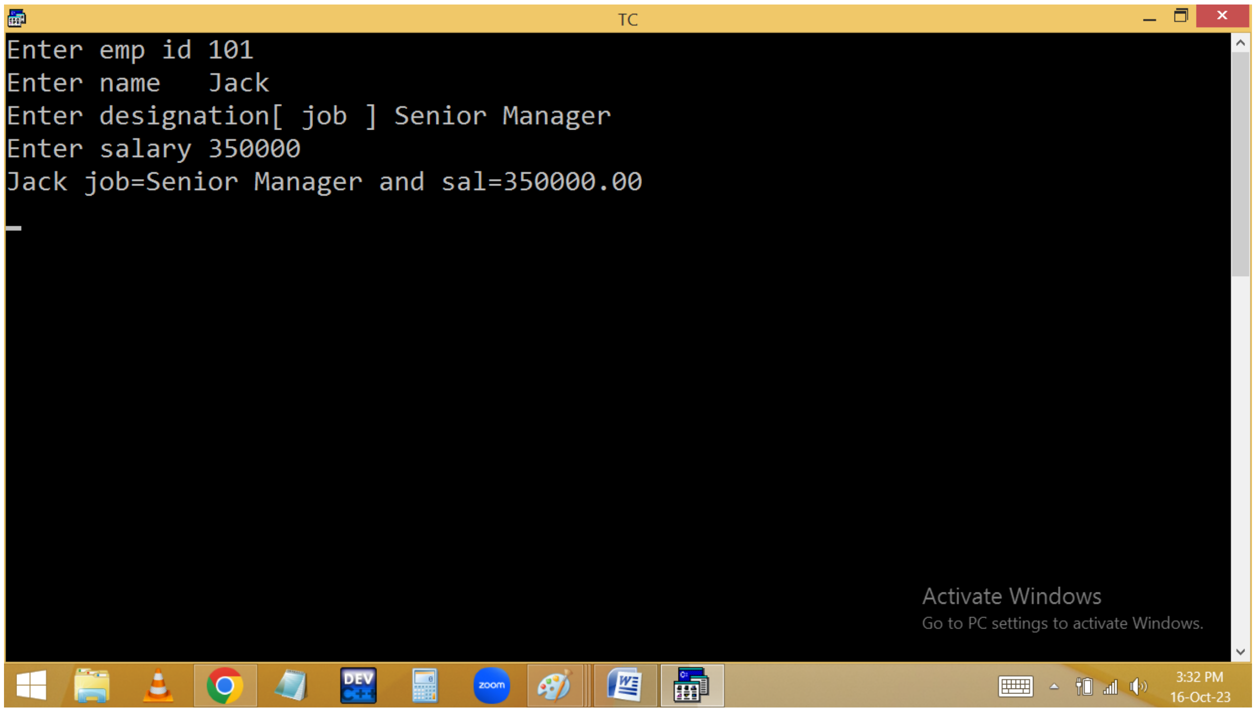
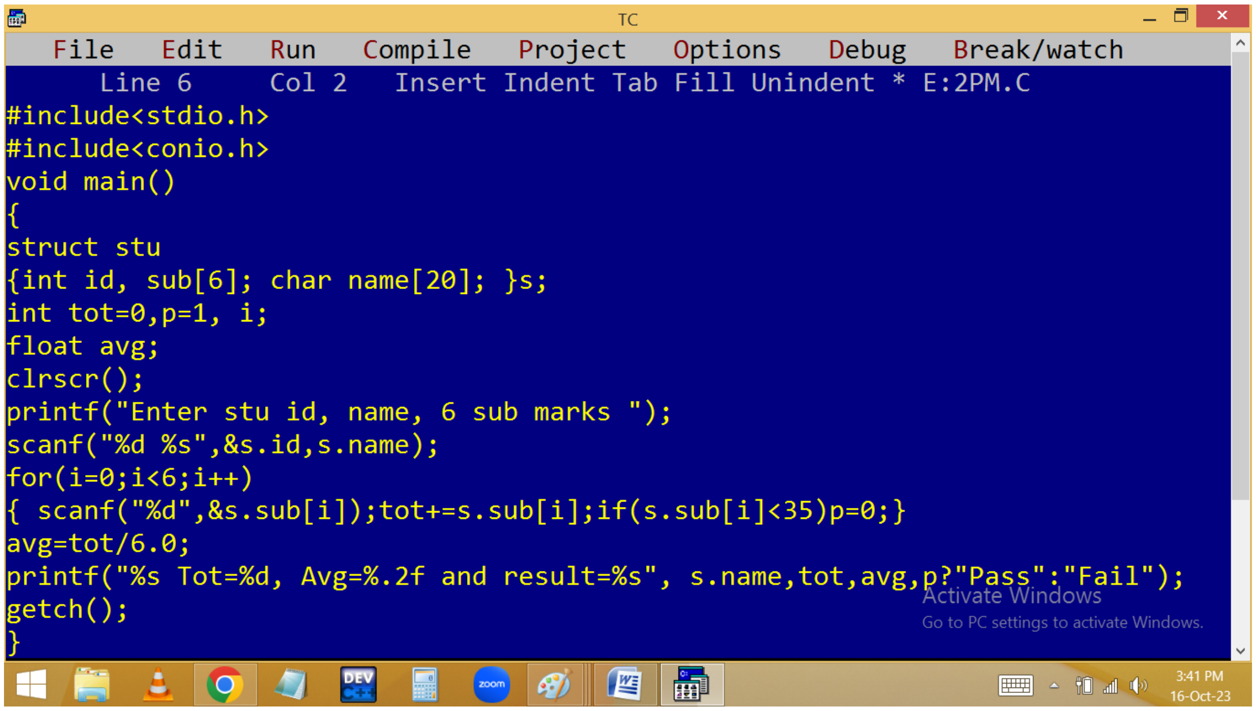
```c
#include<stdio.h>
#include<conio.h>
struct  /* global stru */
{
int id; char  name[20], job[20]; float sal;
}e;/* stru var */
void  main()
{
clrscr();
printf("Enter emp id "); scanf("%d",&e.id);
flushall();
printf("Enter name   "); gets(e.name);
printf("Enter designation[ job ] "); gets(e.job);
printf("Enter salary "); scanf("%f",&e.sal);
printf("%s job=%s and sal=%.2f\n",e.name,e.job,e.sal);
getch();
}
```



```
Enter emp id 101
Enter name   Jack
Enter designation[ job ] Senior Manager
Enter salary 350000
Jack job=Senior Manager and sal=350000.00
```

Finding stu tot,avg and pass/fail using structure:

Using array of structure members: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```c
#include<stdio.h>
#include<conio.h>
void main()
{
struct stu
{int id, sub[6]; char name[20]; }s;
int tot=0,p=1, i;
float avg;
clrscr();
printf("Enter stu id, name, 6 sub marks ");
scanf("%d %s",&s.id,s.name);
for(i=0;i<6;i++)
{ scanf("%d",&s.sub[i]);tot+=s.sub[i];if(s.sub[i]<35)p=0;}
avg=tot/6.0;
printf("%s Tot=%d, Avg=%.2f and result=%s", s.name,tot,avg,p?"Pass":"Fail");
getch();
}
```

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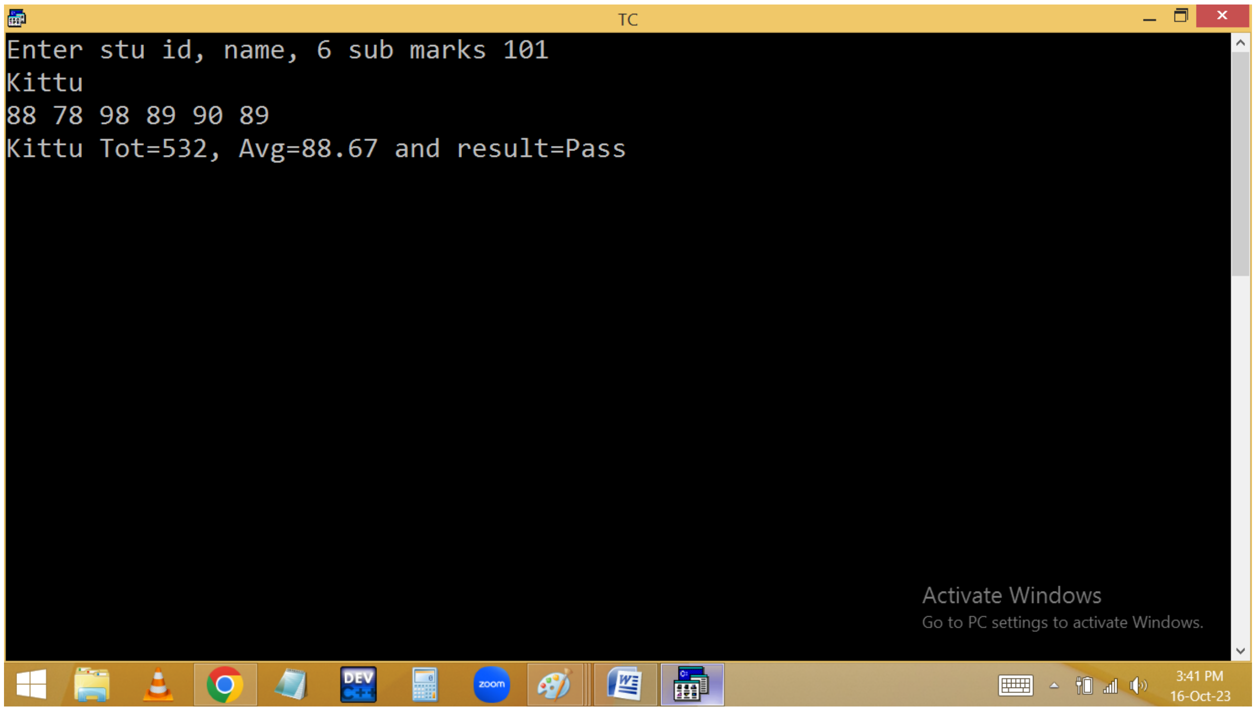
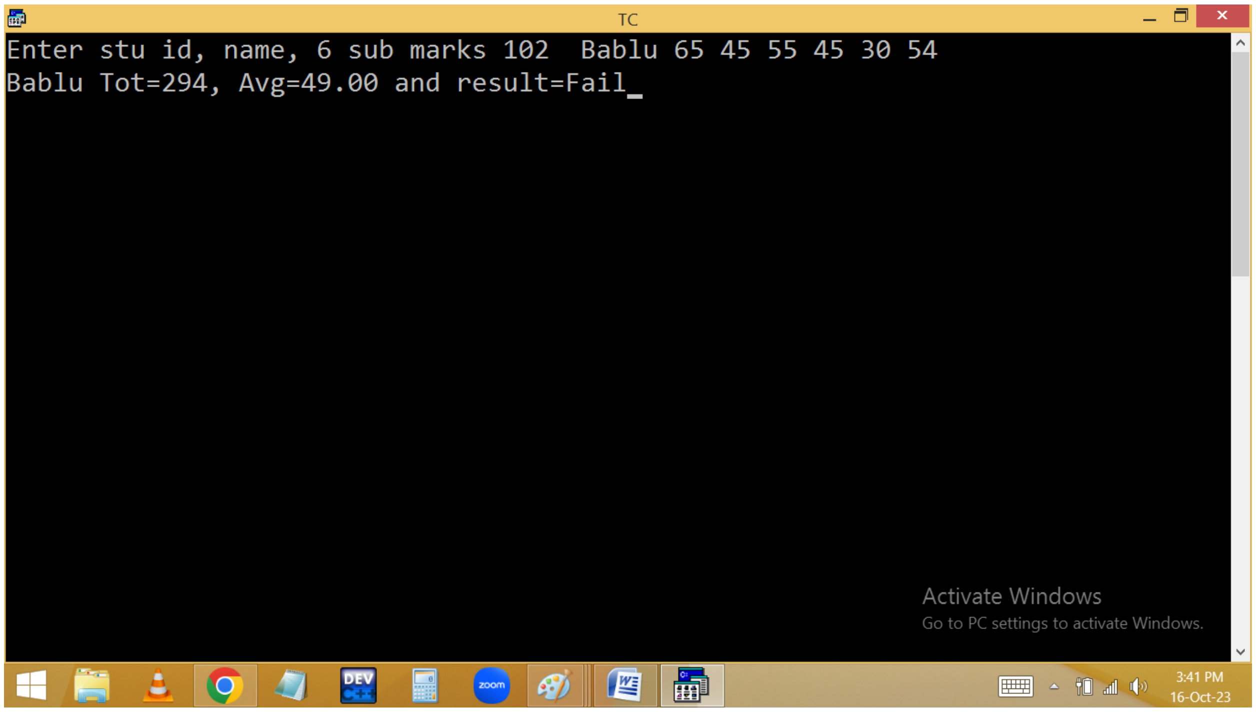


```
Enter stu id, name, 6 sub marks 101
Kittu
88 78 98 89 90 89
Kittu Tot=532, Avg=88.67 and result=Pass
```



```
Enter stu id, name, 6 sub marks 102  Bablu 65 45 55 45 30 54
Bablu Tot=294, Avg=49.00 and result=Fail_
```