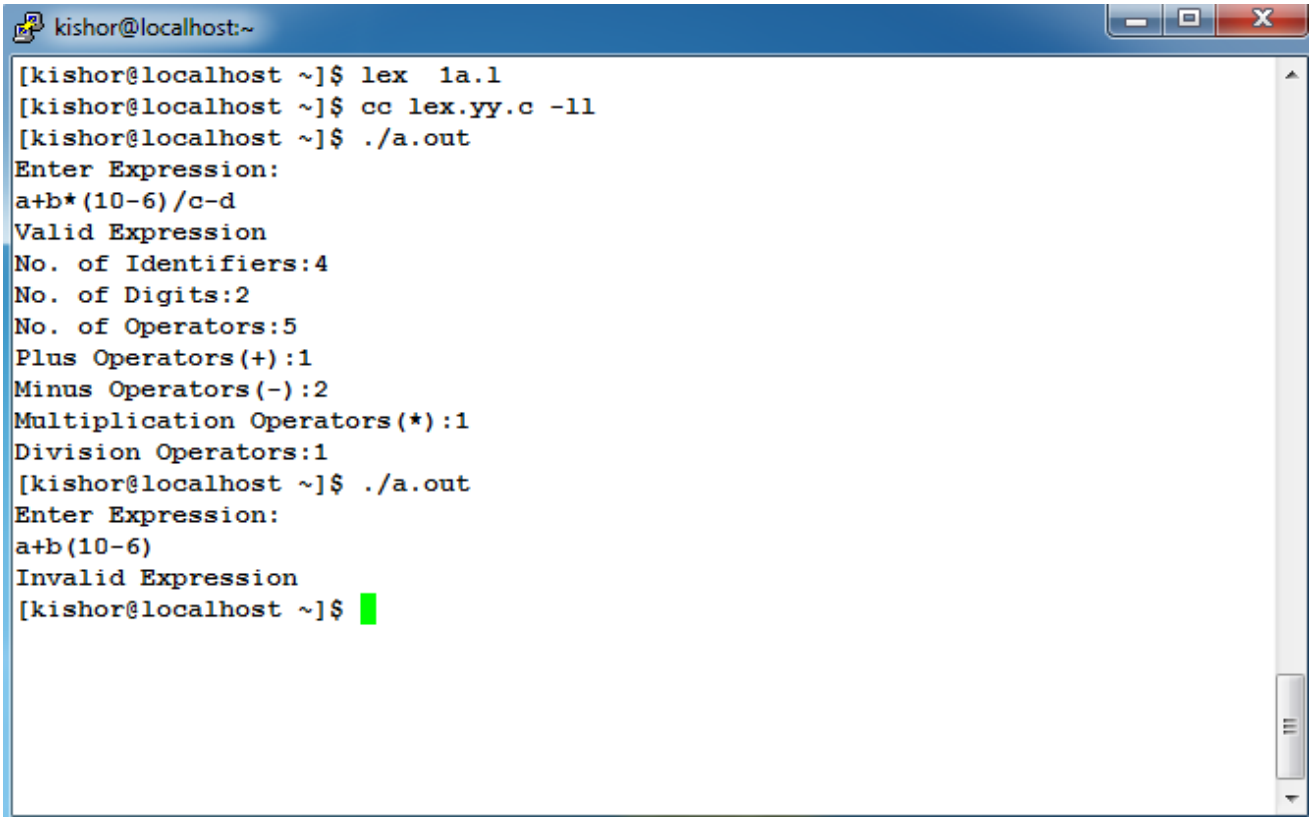
1. a) Write a LEX program to recognize valid *arithmetic expression.* Identifiers in the expression could be only integers and operators could be + and *. Count the identifiers & operators present and print them separately.

```
%{
 int id=0,d=0,op=0,plus=0,min=0,mul=0,dv=0,valid=1;
%}

%%
[0-9]+ {d++;}
[_a-zA-Z][0-9A-Za-z]* {id++;}
[+] {op++;plus++;}
[-] {op++;min++;}
[*] {op++;mul++;}
[/] {op++;dv++;}
\(  {valid++;}
\)  {valid--;}
.   ;
[\n]   {return 0;}
%%

int main()
 {
 printf("Enter Expression:\n");
 yylex();
 if(valid==1&&((d+id)==op+1||op==1))
 {
  printf("Valid Expression\n");
  printf("No. of Identifiers:%d\n",id);
  printf("No. of Digits:%d\n",d);
  printf("No. of Operators:%d\n",op);
  printf("Plus Operators(+):%d\n",plus);
  printf("Minus Operators(-):%d\n",min);
  printf("Multiplication Operators(*):%d\n",mul);
  printf("Division Operators:%d\n",dv);
 }
 else
    printf("Invalid Expression\n");
 return 0;
}
```

OUTPUT:


kishor@localhost:~
[kishor@localhost ~]$ lex 1a.l
[kishor@localhost ~]$ cc lex.yy.c -ll
[kishor@localhost ~]$ ./a.out
Enter Expression:
a+b*(10-6)/c-d
Valid Expression
No. of Identifiers:4
No. of Digits:2
No. of Operators:5
Plus Operators(+):1
Minus Operators(-):2
Multiplication Operators(*):1
Division Operators:1
[kishor@localhost ~]$ ./a.out
Enter Expression:
a+b(10-6)
Invalid Expression
[kishor@localhost ~]$

1. b) Write YACC program to evaluate arithmetic expression involving operators: +, -, *, and /.*/

LEX PART :

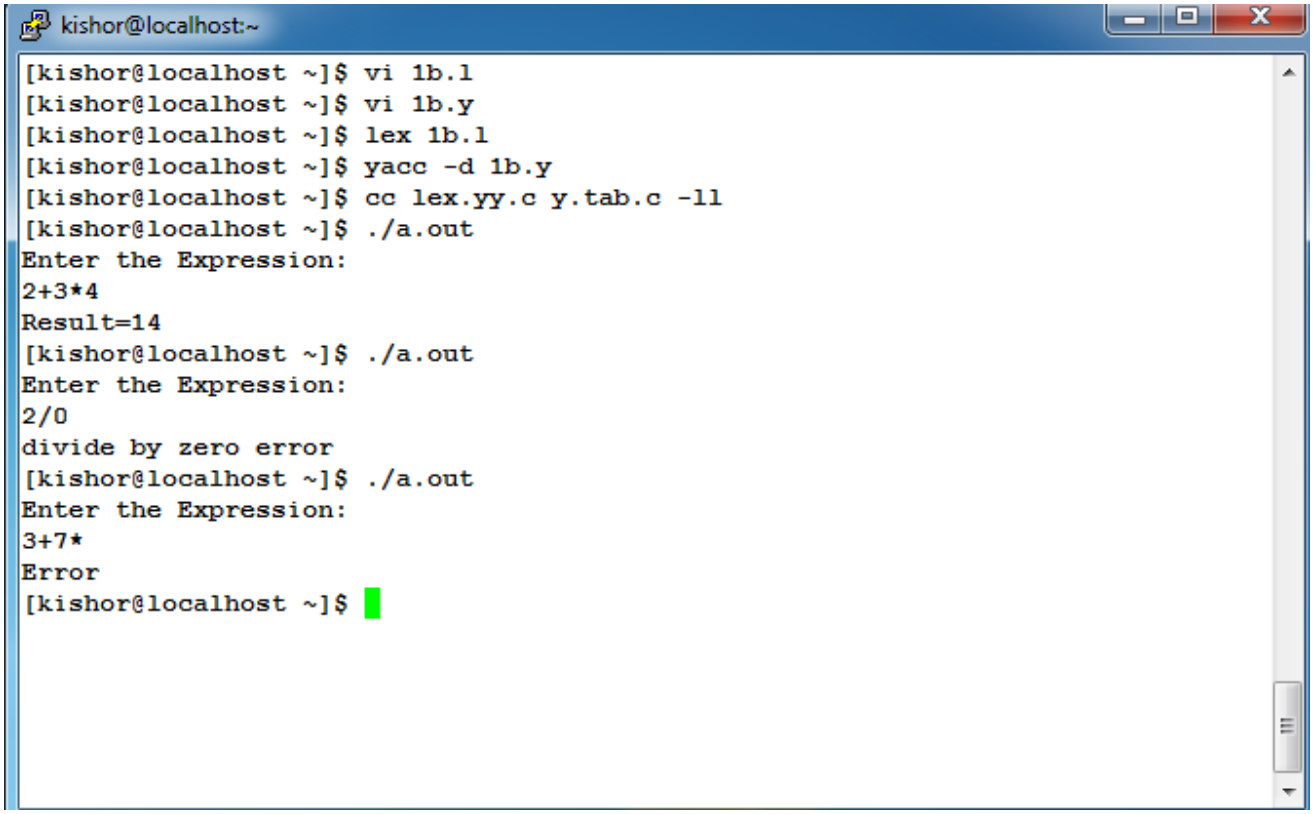
```
%{
  #include"y.tab.h"
  #include<math.h>
  extern yylval;
%}

%%
[0-9]+ {yylval=atoi(yytext);return NUM;}
[+]    {return '+';}
[-]    {return '-';}
[*]     {return '*';}
[/]    {return '/';}
[\t]+  ;
[\n]   {return 0;}
.      {return yytext[0];}
%%
```

YAAC PART :

```
%{
  #include<stdio.h>
  #include<stdlib.h>
%}

%token      NUM
%left       '+''-'
%left       '*''/'
```

```
%%

start:      exp             {printf("%d\n",$$);}

exp:        exp'+'exp       { $$ = $1+$3; }
            |exp'-'exp      { $$ = $1-$3; }
            |exp'*'exp      { $$ = $1*$3; }
            |exp'/'exp
{
       if($3==0)
      {
       yyerror();
      exit(0);
       }
       else
             {
              $$ = $1/$3;
             }
}
            |'('exp')' { $$=$2; }
            |NUM { $$=$1; }
            ;
%%

int main()
{
 printf("Enter the Expression:\n");
 yyparse();
 return 0;
}

int yyerror()
{
 printf("Invalid string\n");
 exit(0);
}
```

OUTPUT:


kishor@localhost:~
[kishor@localhost ~]$ vi 1b.l
[kishor@localhost ~]$ vi 1b.y
[kishor@localhost ~]$ lex 1b.l
[kishor@localhost ~]$ yacc -d 1b.y
[kishor@localhost ~]$ cc lex.yy.c y.tab.c -ll
[kishor@localhost ~]$ ./a.out
Enter the Expression:
2+3*4
Result=14
[kishor@localhost ~]$ ./a.out
Enter the Expression:
2/0
divide by zero error
[kishor@localhost ~]$ ./a.out
Enter the Expression:
3+7*
Error
[kishor@localhost ~]$

2. Develop, Implement and Execute a program using YACC tool to recognize all strings ending with *b* preceded by *n a's* using the grammar *an b* (note: input *n* value)

LEX PART :

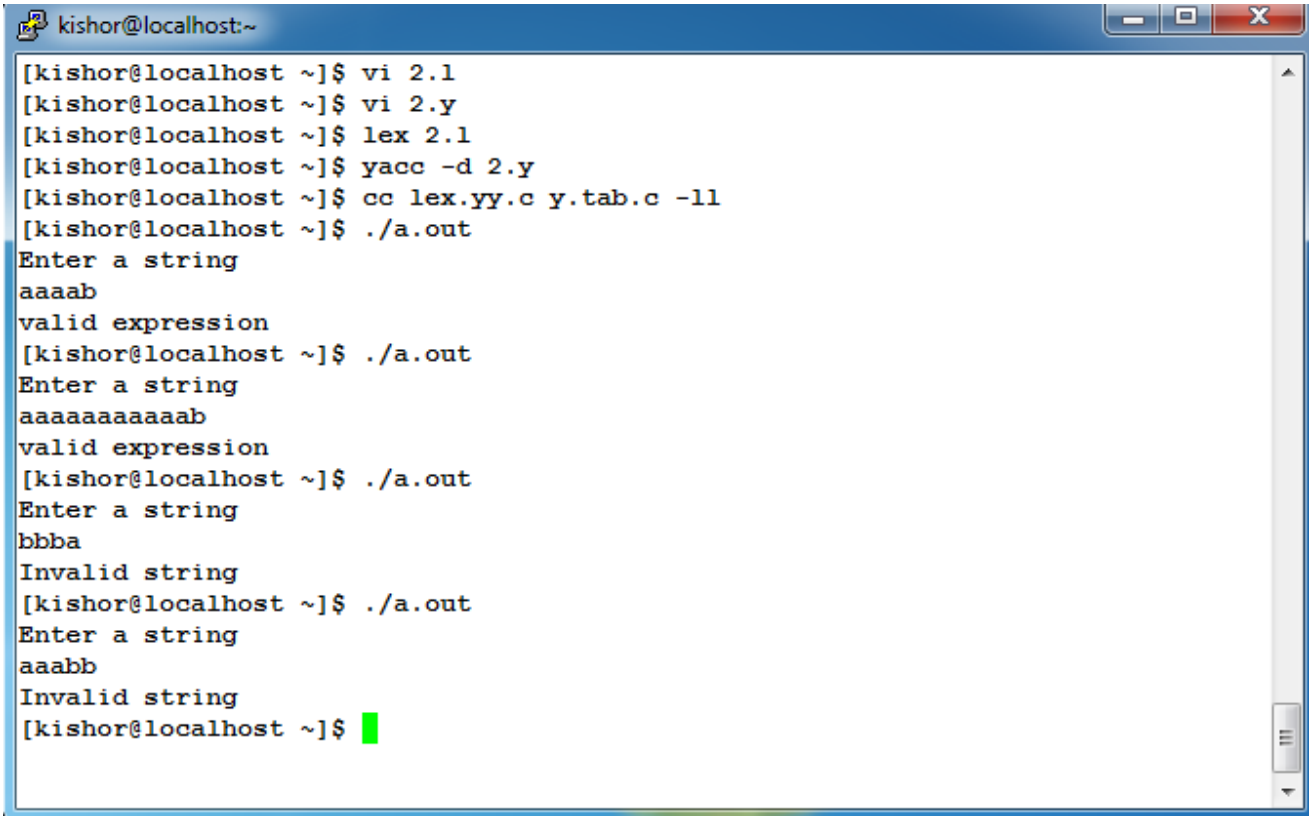
```
%{
 #include "y.tab.h"
%}

%%
a       {return A;}
b       {return B;}
.       {return yytext[0];}
[\n]    {return 0;}
%%
```

YACC PART :

```
%{
  #include<stdio.h>
  #include<stdlib.h>
%}

%token A B

%%
S     :     A s1 B
s1    :     A s1
            |
            ;
%%
```

```
int main()
{
  printf("Enter a string \n");
  yyparse();
  printf("valid expression\n");
}
int yyerror()
{
 printf("Invalid string\n");
 exit(0);
}
```

OUTPUT:



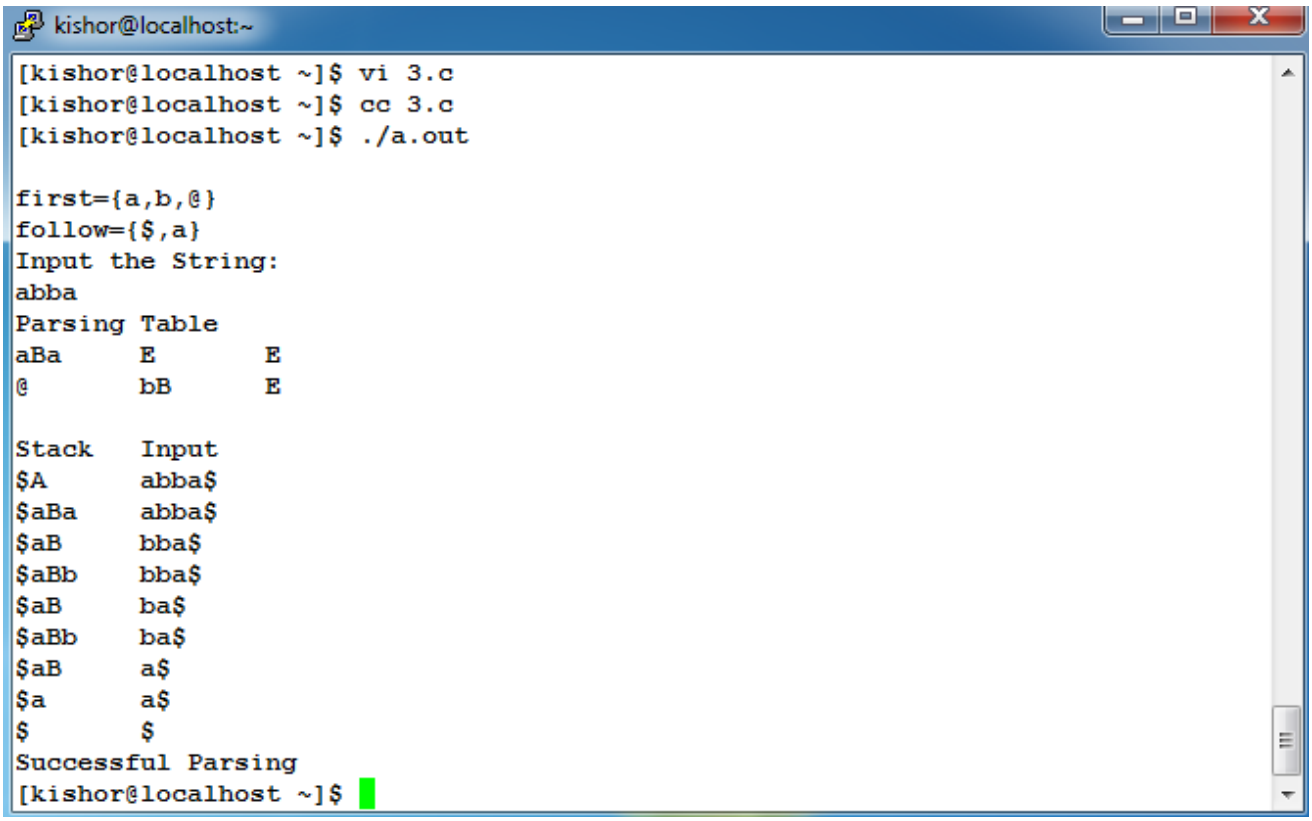
3. Design, develop and implement YACC/C program to construct *Predictive / LL(1) Parsing Table* for the grammar rules: *A ®aBa , B ®bB* | e. Use this table to parse the sentence: *abba$*

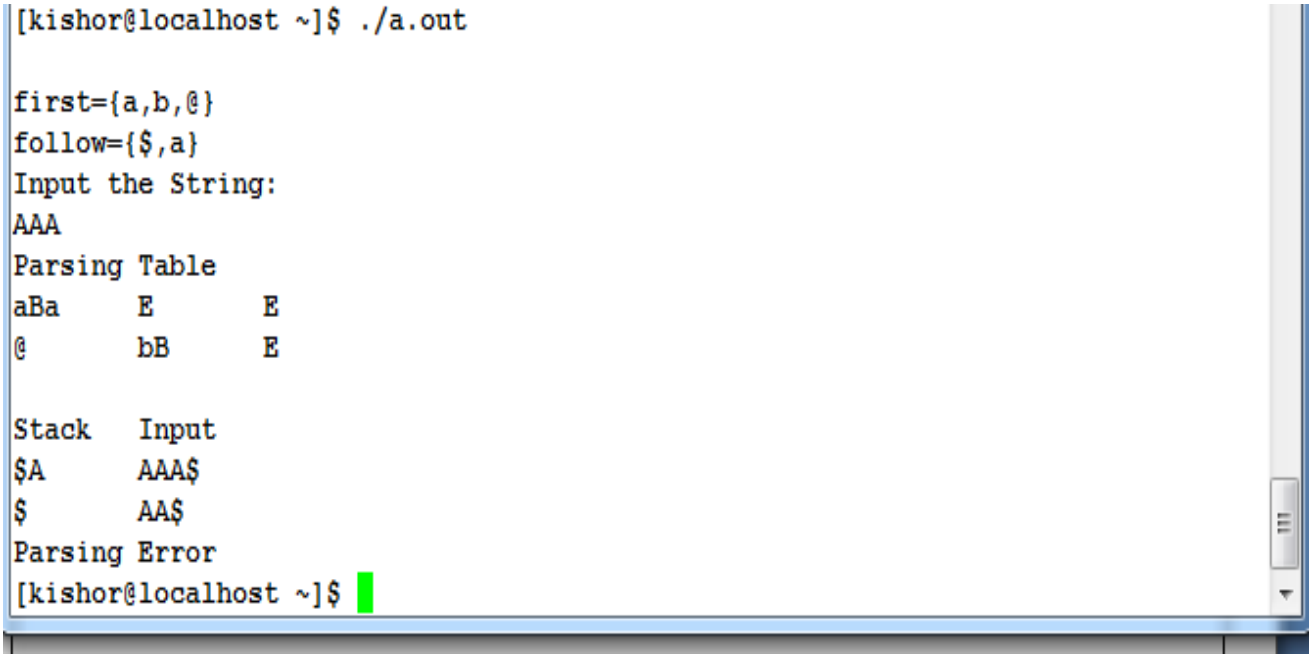
```
#include<stdio.h>
#include<string.h>
#include<stdlib.h>
int num(char c)
{
  switch(c)
  {
    case'A':return 0;
    case'B':return 1;
    case'a':return 0;
    case'b':return 1;
    case'@':return 2;
  }
  return 1;
}
int main()
{
    Char
m[2][3][10]={{"E\0","E\0","E\0"},{"E\0","E\0","E\0"}},ip[100],stack[100];
    char
first[3][10]={"a\0","b\0","@\0"},follow[3][10]={"$\0","a\0","a\0"},LHS[3][3]=
{"A\0","B\0","B\0"},RHS[3][4]={"aBa\0","bB\0","@\0"};
    int size[2][3]={3,1,1,1,2,1},p,q,r,i,j,n,k,row,col;
    printf("\nfirst={%c,%c,%c}",first[0][0],first[1][0],first[2][0]);
    printf("\nfollow={%c,%c}\n\n\n",follow[0][0],follow[1][0]);
    for(i=0;i<3;i++)
    {
        if(first[i][0]!='@')
            strcpy(m[num(LHS[i][0])][num(first[i][0])],RHS[i]);
        else
           strcpy(m[num(LHS[i][0])][num(follow[i][0])],RHS[i]);
    }
    printf("Input the String:\n");
    scanf("%s",ip);
    strcat(ip,"$");
```

```
n=strlen(ip);
stack[0]='$';
stack[1]='A';
i=1;j=0;
printf("Parsing Table\n");
for(p=0;p<2;p++)
{
    for(q=0;q<3;q++)
            printf("%s\t",m[p][q]);
    printf("\n");
}
    printf("\nStack\tInput\n");
    for(k=0;k<=i;k++)
            printf("%c",stack[k]);
    printf("\t");
    for(k=j;k<=n;k++)
            printf("%c",ip[k]);
    printf("\n");
    while((stack[i]!='$')&&(ip[j]!='$'))
    {
            if(stack[i]==ip[j])
            {
                    i--;
                    j++;
                    for(k=0;k<=i;k++)
                            printf("%c",stack[k]);
                    printf("\t");
                    for(k=j;k<=n;k++)
                            printf("%c",ip[k]);
                    printf("\n");
            }
            switch(stack[i])
            {
                    case 'A': row=0;break;
                    case 'B': row=1;break;
                    default:
                            if((stack[i]=='$')&&(ip[j]=='$'))
                                    printf("Successful Parsing\n");
```

```
                        else
                                printf("Parsing Error\n");
                        exit(0);
                }
                switch(ip[j])
                {
                        case 'a': col=0; break;
                        case 'b': col=1; break;
                        case 'c': col=2; break;
                }
                if(m[row][col][0]==ip[j])
                {
                        for(k=size[row][col]-1;k>=0;k--)
                        {
                                stack[i]=m[row][col][k];
                                i++;
                        }
                        i--;
                }
                if(m[row][col][0]=='E')
                {
                        if(i>0)
                        {
                                printf("Error\n");
                                exit(0);
                        }
                }
                if(m[row][col][0]=='@')
                        i--;
                for(k=0;k<=i;k++)
                                printf("%c",stack[k]);
                printf("\t");
                for(k=j;k<=n;k++)
                                printf("%c",ip[k]);
                printf("\n");
        }
}
```

OUTOUT:


kishor@localhost:~
[kishor@localhost ~]$ vi 3.c
[kishor@localhost ~]$ cc 3.c
[kishor@localhost ~]$ ./a.out
first={a,b,@}
follow={$,a}
Input the String:
abba
Parsing Table
aBa E E
@ bB E
Stack Input
$A abba$
$aBa abba$
$aB bba$
$aBb bba$
$aB ba$
$aBb ba$
$aB a$
$a a$
$ $
Successful Parsing
[kishor@localhost ~]$


[kishor@localhost ~]$ ./a.out
first={a,b,@}
follow={$,a}
Input the String:
AAA
Parsing Table
aBa E E
@ bB E
Stack Input
$A AAA$
$ AA$
Parsing Error
[kishor@localhost ~]$

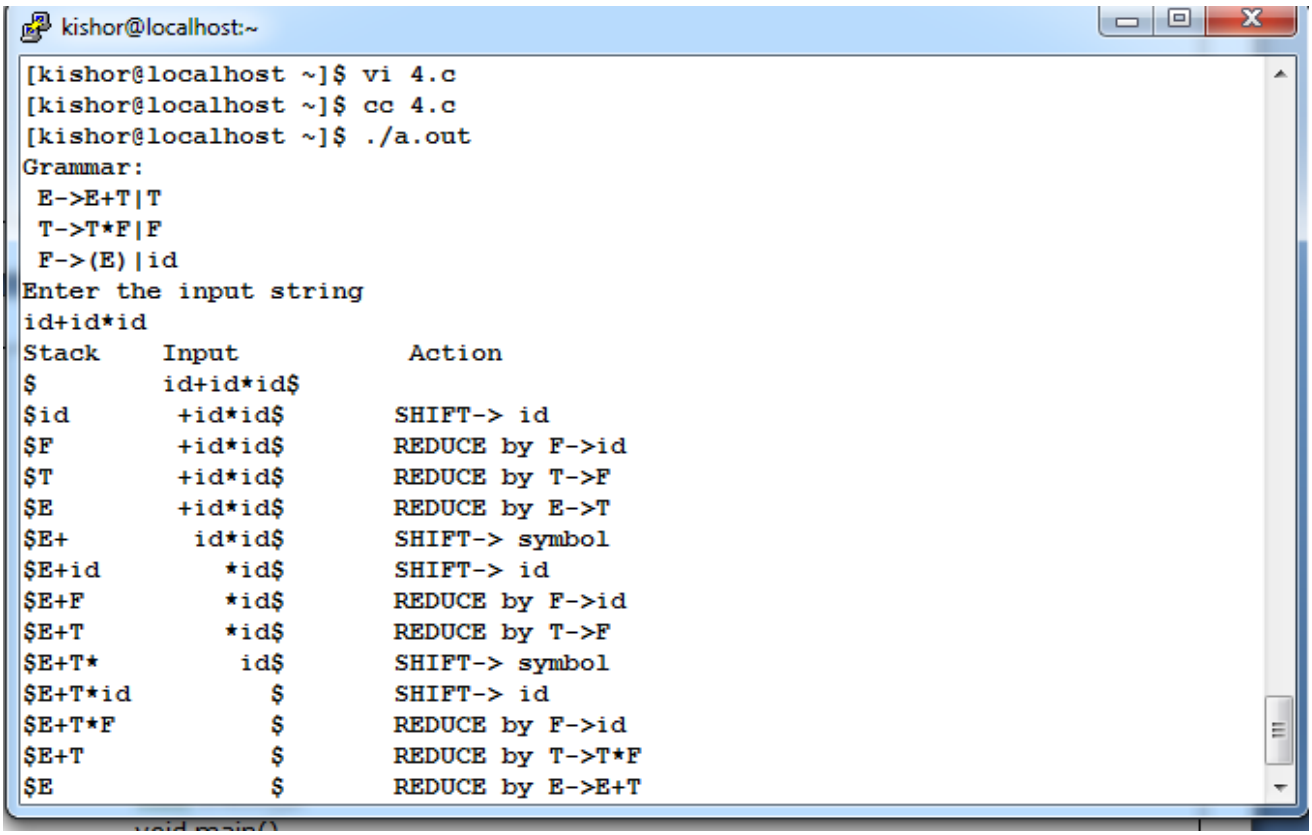
4. Design, develop and implement YACC/C program to demonstrate *Shift Reduce Parsing* technique for the grammar rules: *E ®E+T | T, T ®T*F | F, F ®(E) | id* and parse the sentence: *id + id * id*.

```
#include<stdio.h>
#include<string.h>
int k=0,z=0,i=0,j=0,c=0;
char a[16],ac[20],stk[15],act[10];
void check();
int  main()
{
      printf("Grammar: \n E->E+T|T \n T->T*F|F \n F->(E)|id\n");
      printf("Enter the input string\n");
      scanf("%s",a);
      c=strlen(a);
      strcpy(act,"SHIFT->");
      printf("Stack \t Input \t\t Action\n");
      printf("$\t %s$",a); //Initial contents of the input buffer
      for(k=0,i=0;j<c;k++,i++,j++)
      {
            if(a[j]=='i' && a[j+1]=='d')
            {
                  stk[i]=a[j];
                  stk[i+1]=a[j+1];
                  stk[i+2]='\0';
                  a[j]=' ';
                  a[j+1]=' ';
                  printf("\n$%s\t%s$\t%s id",stk,a,act);
                  check();
            }
            else
            {
                  stk[i]=a[j];
                  stk[i+1]='\0';
                  a[j]=' ';
                  printf("\n$%s\t%s$\t%s symbol",stk,a,act);
                  check();
```

```
            }
        }printf("\n");
        getchar();
}

void check()
{
        strcpy(ac,"REDUCE");
        for(z=0;z<c;z++)
                if(stk[z]=='(' && stk[z+1]=='E'&& stk[z+2]==')')
                {
                        stk[z]='F';
                        stk[z+1]='\0';
                        stk[z+2]='\0';
                        printf("\n$%s\t%s$\t%s by F->(E)",stk,a,ac);
                        i=i-2;
                }
        for(z=0;z<c;z++)
                if(stk[z]=='i' && stk[z+1]=='d')
                {
                        stk[z]='F';
                        stk[z+1]='\0';
                        printf("\n$%s\t%s$\t%s by F->id",stk,a,ac);
                        j++;
                }
        for(z=0;z<c;z++)
        {
                if(stk[z]=='T' && stk[z+1]=='*' && stk[z+2]=='F')
                {
                        stk[z]='T';
                        stk[z+1]='\0';
                        stk[z+2]='\0';
                        printf("\n$%s\t%s$\t%s by T->T*F",stk,a,ac);
                        i=i-2;
                }
                else if(stk[z]=='F')
                {
                        stk[z]='T';
```

```
                printf("\n$%s\t%s$\t%s by T->F",stk,a,ac);
            }
        }
        for(z=0;z<c;z++)
        {
            if(stk[z]=='E' && stk[z+1]=='+' && stk[z+2]=='T' &&
stk[z+3]=='*')
                break;
            if(stk[z]=='E' && stk[z+1]=='+' && stk[z+2]=='T')
                if(a[j+1]=='*')
                    break;
                else
                {
                    stk[z]='E';
                    stk[z+1]='\0';
                    stk[z+2]='\0';
                    printf("\n$%s\t%s$\t%s by E->E+T",stk,a,ac);
                    i=i-2;
                }
                else if(stk[z]=='T')
                {
            if(stk[z+1]=='*'|| a[j+1]=='*')
                break;
                    stk[z]='E';
                    printf("\n$%s\t%s$\t%s by E->T",stk,a,ac);
                }
            }
}
```

OUTPUT:


kishor@localhost:~
[kishor@localhost ~]$ vi 4.c
[kishor@localhost ~]$ cc 4.c
[kishor@localhost ~]$ ./a.out
Grammar:
E->E+T|T
T->T*F|F
F->(E)|id
Enter the input string
id+id*id
Stack Input Action
$ id+id*id$
$id +id*id$ SHIFT-> id
$F +id*id$ REDUCE by F->id
$T +id*id$ REDUCE by T->F
$E +id*id$ REDUCE by E->T
$E+ id*id$ SHIFT-> symbol
$E+id *id$ SHIFT-> id
$E+F *id$ REDUCE by F->id
$E+T *id$ REDUCE by T->F
$E+T* id$ SHIFT-> symbol
$E+T*id $ SHIFT-> id
$E+T*F $ REDUCE by F->id
$E+T $ REDUCE by T->T*F
$E $ REDUCE by E->E+T

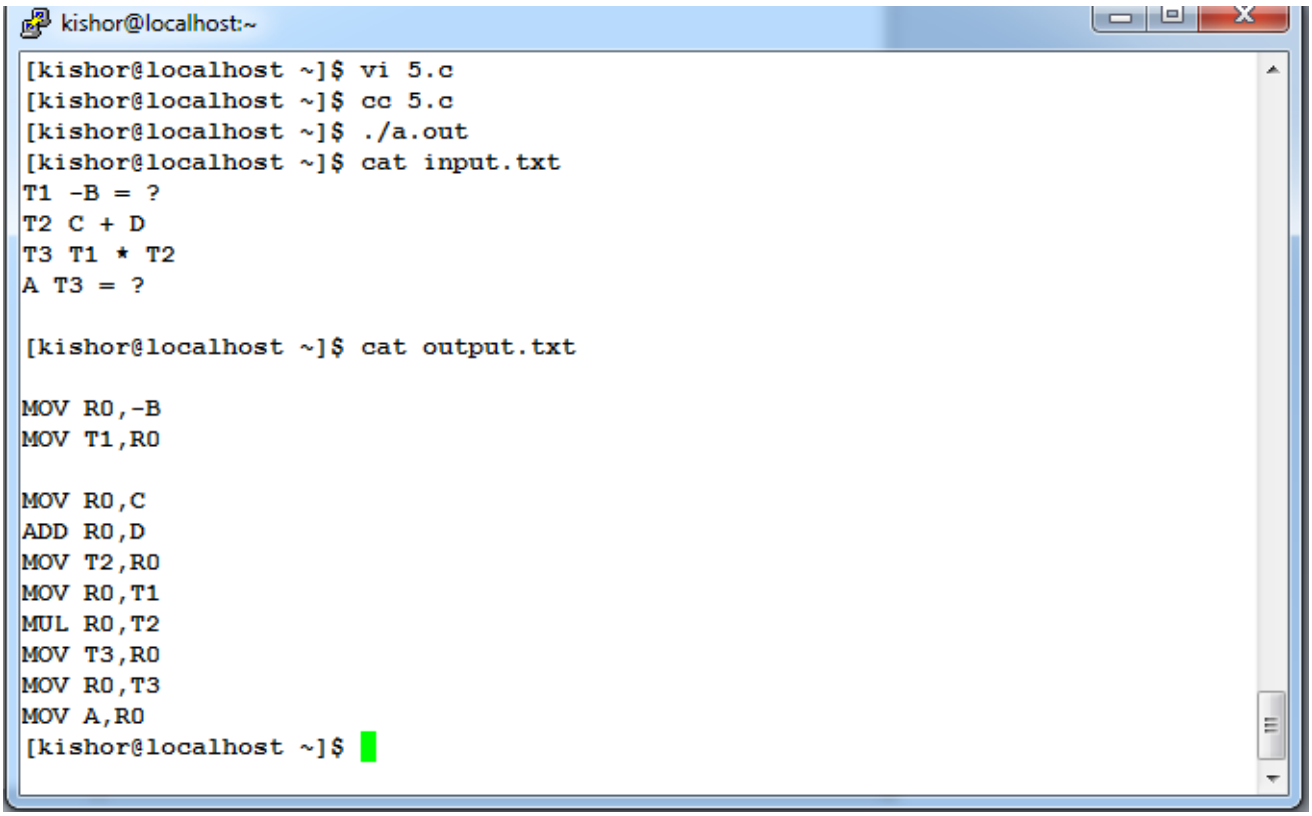
5. Design, develop and implement a C/Java program to generate the machine code using *Triples* for the statement *A = -B * (C +D)* whose intermediate code in three-address form

T1 = -B
T2 = C + D
T3 = T1 + T2
A = T3

```
#include<stdio.h>
#include<stdlib.h>
#include<string.h>
char op[2],arg1[5],arg2[5],result[5];
int count=0;
int  main()
{
	FILE *fp1,*fp2;
	fp1=fopen("input.txt","r");
	fp2=fopen("output.txt","w");
	while(!feof(fp1) && count<4)
	{
		count ++;
		fscanf(fp1,"%s%s%s%s",result,arg1,op,arg2);
		if(strcmp(op,"+")==0)
		{
			fprintf(fp2,"\nMOV R0,%s",arg1);
			fprintf(fp2,"\nADD R0,%s",arg2);
			fprintf(fp2,"\nMOV %s,R0",result);
		}
		if(strcmp(op,"*")==0)
		{
			fprintf(fp2,"\nMOV R0,%s",arg1);
			fprintf(fp2,"\nMUL R0,%s",arg2);
			fprintf(fp2,"\nMOV %s,R0",result);
		}
		if(strcmp(op,"-")==0)
		{
			fprintf(fp2,"\nMOV R0,%s",arg1);
			fprintf(fp2,"\nSUB R0,%s",arg2);
```

```
                fprintf(fp2,"\nMOV %s,R0",result);
            }
            if(strcmp(op,"/")==0)
            {
                fprintf(fp2,"\nMOV R0,%s",arg1);
                fprintf(fp2,"\nDIV R0,%s",arg2);
                fprintf(fp2,"\nMOV %s,R0",result);
            }
            if(strcmp(op,"=")==0)
            {
                fprintf(fp2,"\nMOV R0,%s",arg1);
                fprintf(fp2,"\nMOV %s,R0",result);
            }
        }
        fclose(fp1);
        fclose(fp2);
}
```

OUTPUT:


kishor@localhost:~
[kishor@localhost ~]$ vi 5.c
[kishor@localhost ~]$ cc 5.c
[kishor@localhost ~]$ ./a.out
[kishor@localhost ~]$ cat input.txt
T1 -B = ?
T2 C + D
T3 T1 * T2
A T3 = ?
[kishor@localhost ~]$ cat output.txt
MOV R0,-B
MOV T1,R0
MOV R0,C
ADD R0,D
MOV T2,R0
MOV R0,T1
MUL R0,T2
MOV T3,R0
MOV R0,T3
MOV A,R0
[kishor@localhost ~]$

6. a) Write a LEX program to eliminate *comment lines* in a *C* program and copy the resulting program into a separate file.

```
%{
#include<stdio.h>
int com=0;
%}
%%
"/*"[^*]*.*"*/" {com++;}
\/\/[^\n]*   com++;
%%
main(int argc,char *argv[])
{
if(argc!=3)
      {
          printf("\n\tUsage : %s <input file><output file>\n", argv[0]);
          return;
      }
yyin=fopen(argv[1], "r");
yyout=fopen(argv[2], "w");
yylex();
printf(" No of comment lines =%d\n",com);

}
```

OUTPUT:

kishor@localhost:~

```
[kishor@localhost ~]$ vi 6a.l
[kishor@localhost ~]$ lex 6a.l
[kishor@localhost ~]$ cc lex.yy.c -ll
[kishor@localhost ~]$ ./a.out

        Usage : ./a.out <input file><output file>
[kishor@localhost ~]$ ./a.out in.c out.c
 No of comment lines =5
[kishor@localhost ~]$ cat in.c
/* Program to add two integers*/
#include<stdio.h>
main()
{
int a, b,sum;
printf(("enter the first number\n");
scanf("%d",&a);//read value for a
printf(("enter the second number\n");
scanf("%d",&b);//read value for b
sum=a+b;//addtion operation
printf("Sum=%d\n",sum);/*display result*/

[kishor@localhost ~]$
```

kishor@localhost:~

```
[kishor@localhost ~]$ cat out.c

#include<stdio.h>
main()
{
int a, b,sum;
printf(("enter the first number\n");
scanf("%d",&a);
printf(("enter the second number\n");
scanf("%d",&b);
sum=a+b;
printf("Sum=%d\n",sum);

[kishor@localhost ~]$
```

6. b) Write YACC program to recognize valid *identifier, operators and keywords* in the given text (*C program*) file.

LEX PART :

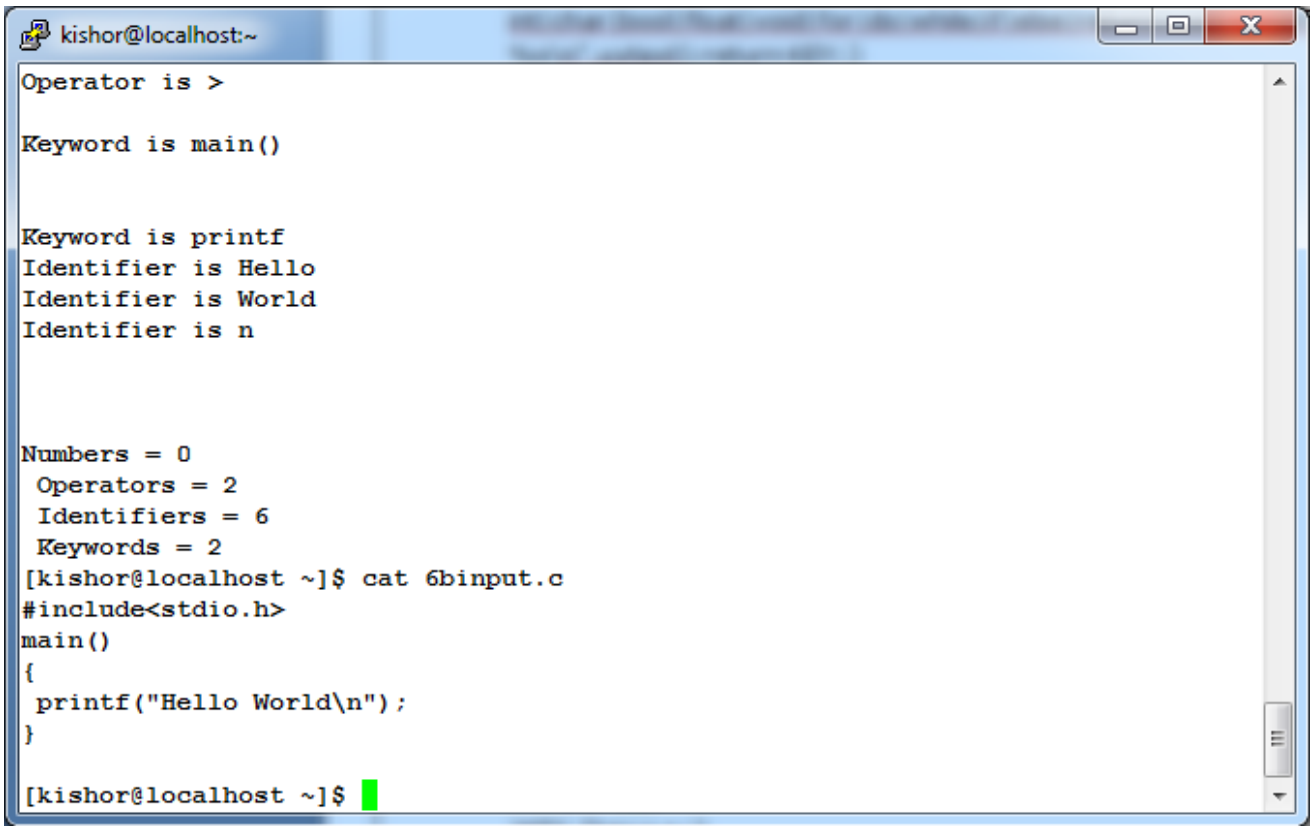
```
%{
 #include <stdio.h>
 #include "y.tab.h"
 extern yylval;
%}

%%
[ \t] ;
[+|-|*|/|=|<|>] {printf("Operator is %s\n",yytext);return OP;}
[0-9]+ {yylval = atoi(yytext); printf("Number is %d\n",yylval); return DIG;}
int|char|bool|float|void|for|do|while|if|else|return|void|printf|scanf|”main()”
{printf("Keyword is %s\n",yytext);return KEY;}
[a-zA-Z0-9]+ {printf("Identifier is %s\n",yytext);return ID;}
.   ;
%%
```

YACC PART :

```
%{
 #include<stdio.h>
 #include<stdlib.h>
 int id=0,dig=0,key=0,op=0;
%}
%token DIG ID KEY OP

%%
input:
 DIG input{dig++;}
|ID input{id++;}
|KEY input{key++;}
|OP input{op++;}
|DIG {dig++;}
|ID {id++;}
|KEY {key++;}
```

```
|OP {op++;} ;
%%

 FILE *yyin;
int main()
{
 FILE *fp=fopen("6binput.c","r");
 if(!fp)
 {
  printf("File not found\n");
  return -1;
 }
 yyin=fp;
 do{
    yyparse();
 }while(!feof(yyin));
 printf("Numbers = %d\n Operators = %d\n Identifiers = %d\n Keywords =
%d\n",dig,op,id,key);
}

int yyerror()
{
 printf("Error \n");
 exit(-1);
}
```

OUTPUT:


kishor@localhost:~
Operator is >
Keyword is main()
Keyword is printf
Identifier is Hello
Identifier is World
Identifier is n
Numbers = 0
Operators = 2
Identifiers = 6
Keywords = 2
[kishor@localhost ~]$ cat 6binput.c
#include<stdio.h>
main()
{
printf("Hello World\n");
}
[kishor@localhost ~]$

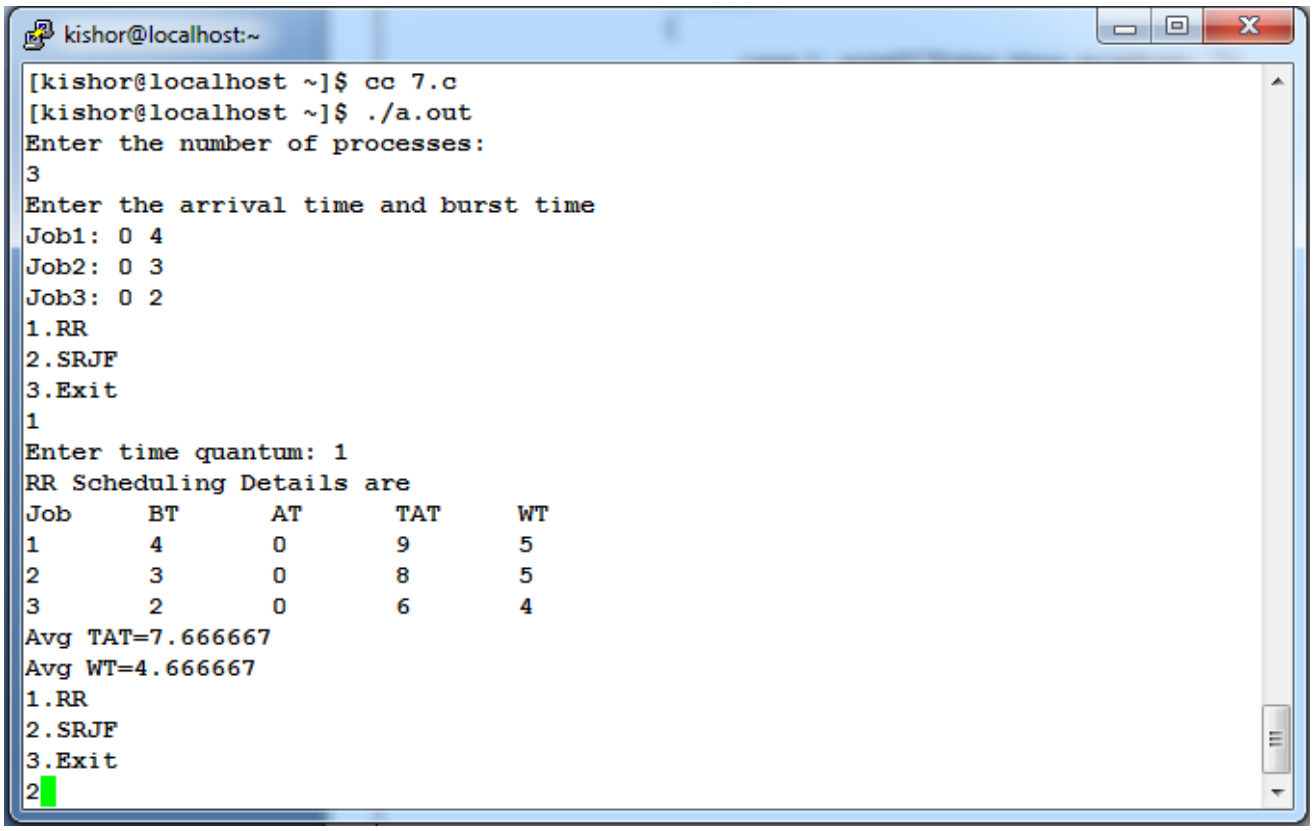
7. Design, develop and implement a C/C++/Java program to simulate the working of Shortest remaining time first and Round Robin (RR) scheduling algorithms. Experiment with different quantum sizes for RR algorithm.

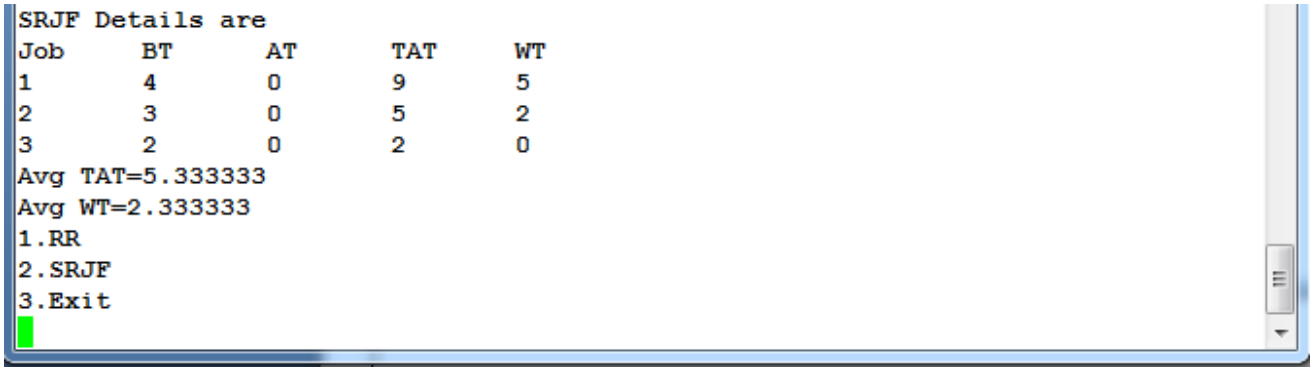
```
#include<stdio.h>
#include<stdlib.h>
struct J
{
  int id,bt,tat,wt,at,ft;
} job[100];
void scheduler(struct J job[],int n,int q,int c)
{
	int burst[100],x,t=0,done=0,curr=0,diff=q,i=0;
	float tat_sum=0,wt_sum=0;
	for(i=0;i<n;i++)
	 burst[i]=job[i].bt;
	if(c==0)
		curr=-1;
	while(done<n)
	{
		if(c==1)
		{
			for(x=0;x<n;x++)
			{
				if(job[curr].bt==0)
					curr=x;
				if(job[x].bt<job[curr].bt && job[x].bt>0 &&
job[x].at<=t)
					curr=x;
			}
			diff=1;
		}
		else
		{
			while(1)
			{
				curr=(curr+1)%n;
```

```
                        if(job[curr].bt!=0)
                                break;
                }
                diff=(q<=job[curr].bt)?q:job[curr].bt;
        }
        job[curr].bt-=diff;
        t+=diff;
        if(job[curr].bt==0)
        {
                done++;
                job[curr].ft=t;
        }
    }
    if(c==1)
     printf("SRJF Details are \n");
    else
     printf("RR Scheduling Details are \n");
    for(i=0;i<n;i++)
    {
      job[i].bt=burst[i];
      job[i].tat=job[i].ft-job[i].at;
      job[i].wt=job[i].tat-job[i].bt;
      tat_sum+=job[i].tat;
      wt_sum+=job[i].wt;
    }
    printf("Job\tBT\tAT\tTAT\tWT\n");
    for(i=0;i<n;i++)

printf("%d\t%d\t%d\t%d\t%d\n",i+1,job[i].bt,job[i].at,job[i].tat,job[i].wt);
    printf("Avg TAT=%f\nAvg WT=%f\n",tat_sum/n,wt_sum/n);
}
void main()
{
    int n,q,c,i;
    printf("Enter the number of processes:\n");
    scanf("%d",&n);
    printf("Enter the arrival time and burst time\n");
    for(i=0;i<n;i++)
```

```
        {
                printf("Job%d: ",i+1);
                scanf("%d%d",&job[i].at,&job[i].bt);
        }
        while(1)
        {
                printf("1.RR\n2.SRJF\n3.Exit\n");
                scanf("%d",&c);
                switch(c)
                {
                        case 1: printf("Enter time quantum: ");
                                        scanf("%d",&q);
                                        scheduler(job,n,q,0);
                                        break;
                        case 2: scheduler(job,n,1,1);
                                        break;
                        case 3: exit(0);
                }
        }
}
```

OUTPUT:


kishor@localhost:~
[kishor@localhost ~]$ cc 7.c
[kishor@localhost ~]$ ./a.out
Enter the number of processes:
3
Enter the arrival time and burst time
Job1: 0 4
Job2: 0 3
Job3: 0 2
1.RR
2.SRJF
3.Exit
1
Enter time quantum: 1
RR Scheduling Details are
Job BT AT TAT WT
1 4 0 9 5
2 3 0 8 5
3 2 0 6 4
Avg TAT=7.666667
Avg WT=4.666667
1.RR
2.SRJF
3.Exit
2

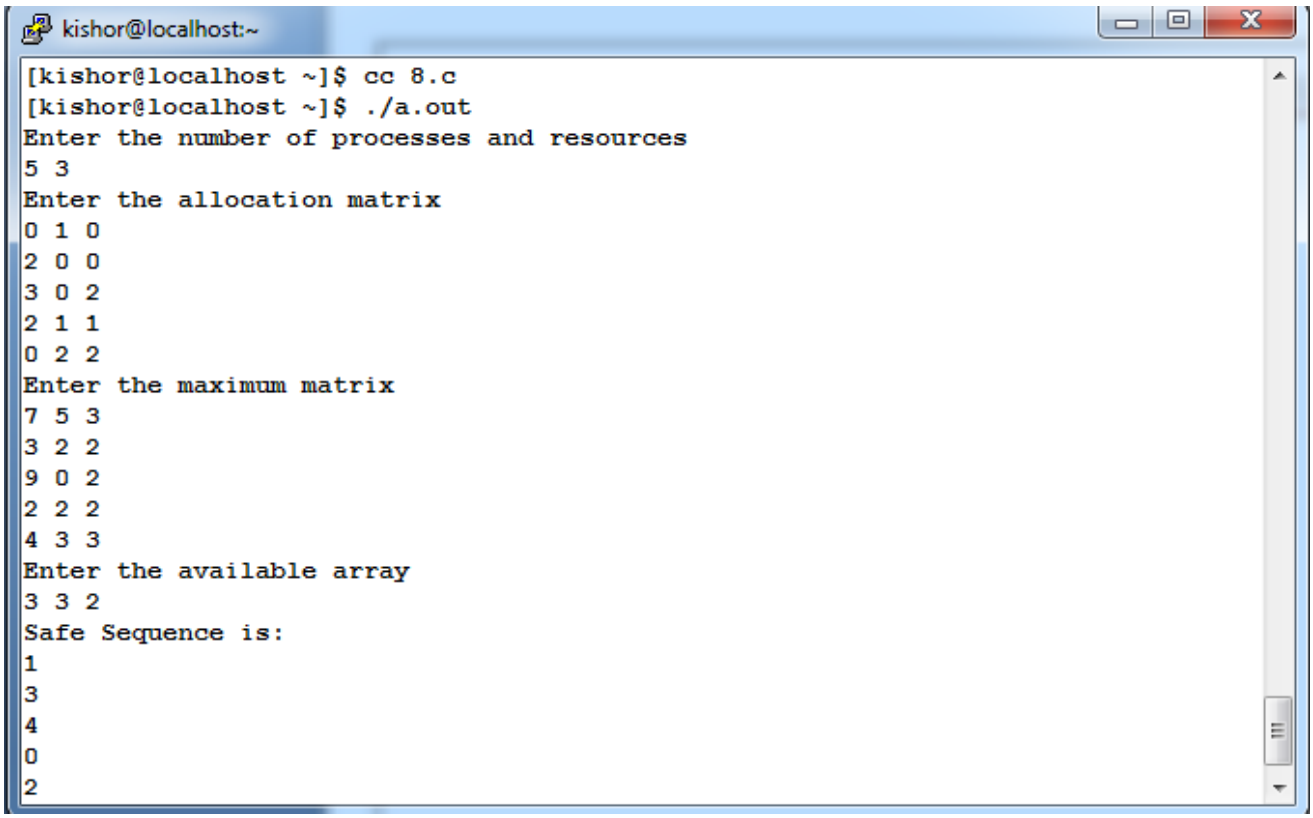

SRJF Details are
Job BT AT TAT WT
1 4 0 9 5
2 3 0 5 2
3 2 0 2 0
Avg TAT=5.333333
Avg WT=2.333333
1.RR
2.SRJF
3.Exit

8. Design, develop and implement a C/C++/Java program to implement Banker's algorithm. Assume suitable input required to demonstrate the results

```
#include<stdio.h>
#include<stdlib.h>
int
alloc[10][10],max[10][10],need[10][10],avail[10],work[10],finish[10],request[
10];
int p,r,j,i,k,v=0,req=0,pno;
int check(int i)
{
	for(j=0;j<r;j++)
		if(need[i][j]>work[j])
			return 0;
	return 1;
}
int main()
{
	printf("Enter the number of processes and resources\n");
	scanf("%d%d",&p,&r);
	int seq[p];
	printf("Enter the allocation matrix\n");
	for(i=0;i<p;i++)
		for(j=0;j<r;j++)
			scanf("%d",&alloc[i][j]);
	printf("Enter the maximum matrix\n");
	for(i=0;i<p;i++)
		for(j=0;j<r;j++)
			scanf("%d",&max[i][j]);
	for(i=0;i<p;i++)
		for(j=0;j<r;j++)
			need[i][j]=max[i][j]-alloc[i][j];
	printf("Enter the available array\n");
	for(i=0;i<r;i++)
	{
		scanf("%d",&avail[i]);
```

```
            work[i]=avail[i];
        }
        L1:for(i=0;i<p;i++)
             finish[i]=0;
        while(v<p)
        {
            int allocated=0;
            for(i=0;i<p;i++)
                if(!finish[i]&&check(i))
                {
                    for(k=0;k<r;k++)
                        work[k]=work[k]+alloc[i][k];
                    allocated=finish[i]=1;
                    seq[v]=i;
                    v++;
                }
            if(!allocated)
                break;
        }
        for(i=0;i<p;i++)
            if(finish[i]==0)
            {
                printf("Safe Sequence is not generated\n");
                exit(0);
            }
        printf("Safe Sequence is: \n");
        for(i=0;i<v;i++)
            printf("%d\t",seq[i]);
        printf("\n");

}
```

OUTPUT:


kishor@localhost:~
[kishor@localhost ~]$ cc 8.c
[kishor@localhost ~]$ ./a.out
Enter the number of processes and resources
5 3
Enter the allocation matrix
0 1 0
2 0 0
3 0 2
2 1 1
0 2 2
Enter the maximum matrix
7 5 3
3 2 2
9 0 2
2 2 2
4 3 3
Enter the available array
3 3 2
Safe Sequence is:
1
3
4
0
2

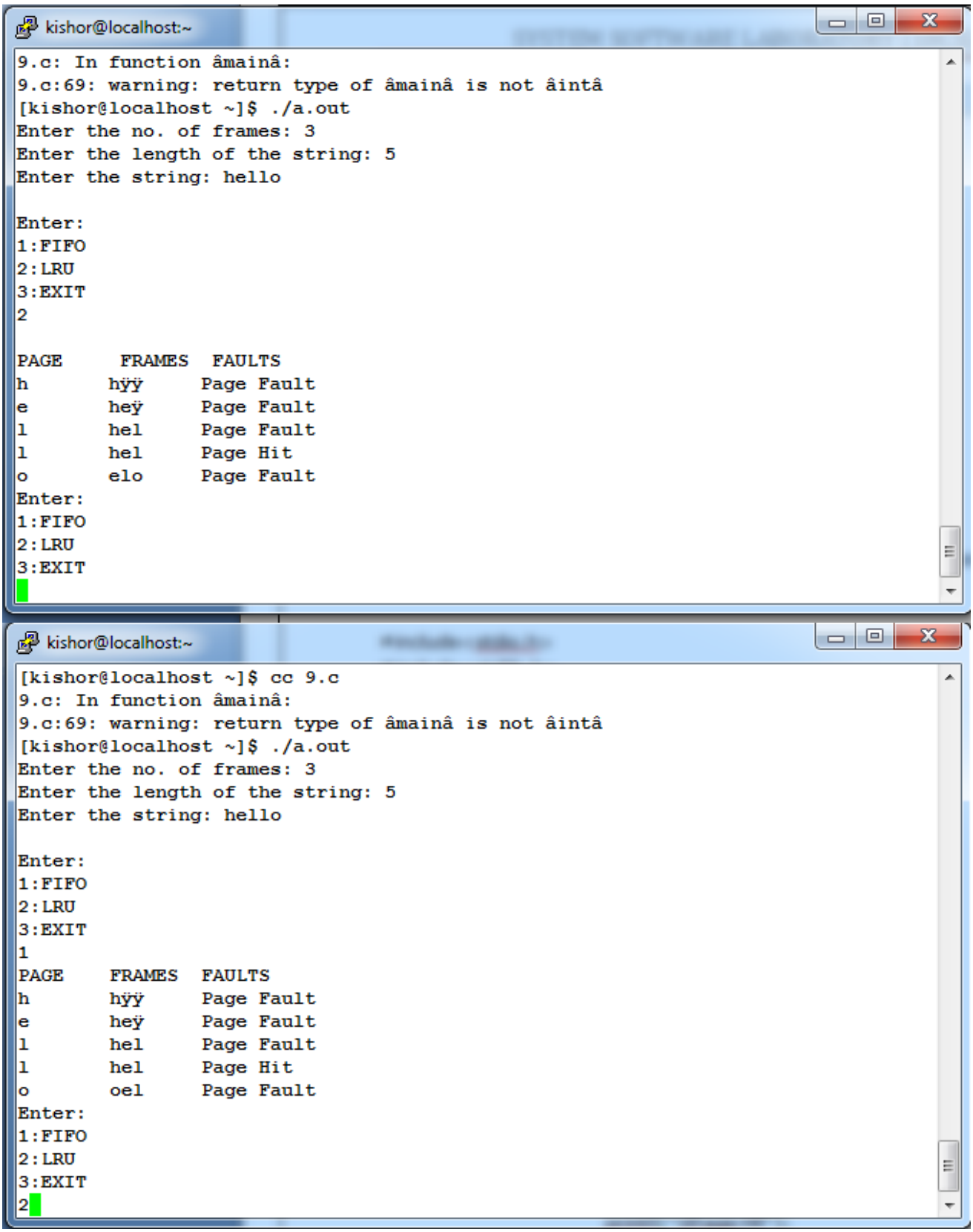
9. Design, develop and implement a C/C++/Java program to implement page replacement algorithms LRU and FIFO. Assume suitable input required to demonstrate the results.

```
#include<stdio.h>
#include<stdlib.h>
void FIFO(char s[],char F[],int l,int f)
{
        int i,j=0,k,flag=0;
        printf("PAGE\tFRAMES\tFAULTS");
        for(i=0;i<l;i++)
        {
            for(k=0;k<f;k++)
                if(F[k]==s[i])
                   flag=1;
            printf("\n%c\t",s[i]);
            if(flag==0)
            {
                F[j++]=s[i];
                printf("%s",F);
                printf("\tPage Fault");
            }
            else
            {
                flag=0;
                printf("%s",F);
                printf("\tPage Hit");
            }
            if(j==f)
                j=0;
        }
}
void lru(char s[],char F[],int l,int f)
{
        int i,j=0,k,m,flag=0,top=0;
        printf("\nPAGE\t FRAMES\t FAULTS");
        for(i=0;i<l;i++)
        {
            for(k=0;k<f;k++)
```

```
                        if(F[k]==s[i])
                                flag=1;
                printf("\n%c\t",s[i]);
                if(j!=f && flag!=1)
                {
                        F[top]=s[i];
                        if(++j!=f)
                                top++;
                }
                else
                {
                        if(flag!=1)
                        {
                                for(k=0;k<top;k++)
                                        F[k]=F[k+1];
                                F[top]=s[i];
                        }
                        else
                        {
                                for(m=k;m<top;m++)
                                        F[m]=F[m+1];
                                F[top]=s[i];
                        }
                }
        printf("%s",F);
        if(flag==0)
                printf("\tPage Fault");
        else
                printf("\tPage Hit");
        flag=0;
        }
}
Int main()
{
        int ch,i,l,f;
        char F[10],s[25];
        printf("Enter the no. of frames: ");
        scanf("%d",&f);
```

```
        F[f]='\0';
        printf("Enter the length of the string: ");
        scanf("%d",&l);
        printf("Enter the string: ");
        scanf("%s",s);
        while(1)
        {
                printf("\nEnter:\n1:FIFO\n2:LRU\n3:EXIT\n");
                scanf("%d",&ch);
                switch(ch)
                {
                        case 1:     for(i=0;i<f;i++)
                                        F[i]=-1;
                                    FIFO(s,F,l,f);
                                    break;
                        case 2:     for(i=0;i<f;i++)
                                        F[i]=-1;
                                    lru(s,F,l,f);
                                    break;
                        case 3:     exit(0);
                }
        }
}
```

OUTPUT:


kishor@localhost:~
9.c: In function âmainâ:
9.c:69: warning: return type of âmainâ is not âintâ
[kishor@localhost ~]$ ./a.out
Enter the no. of frames: 3
Enter the length of the string: 5
Enter the string: hello
Enter:
1:FIFO
2:LRU
3:EXIT
2
PAGE FRAMES FAULTS
h hÿÿ Page Fault
e heÿ Page Fault
l hel Page Fault
l hel Page Hit
o elo Page Fault
Enter:
1:FIFO
2:LRU
3:EXIT
kishor@localhost:~
[kishor@localhost ~]$ cc 9.c
9.c: In function âmainâ:
9.c:69: warning: return type of âmainâ is not âintâ
[kishor@localhost ~]$ ./a.out
Enter the no. of frames: 3
Enter the length of the string: 5
Enter the string: hello
Enter:
1:FIFO
2:LRU
3:EXIT
1
PAGE FRAMES FAULTS
h hÿÿ Page Fault
e heÿ Page Fault
l hel Page Fault
l hel Page Hit
o oel Page Fault
Enter:
1:FIFO
2:LRU
3:EXIT
2