Shri Ramdeobaba College of Engineering and Management, Nagpur
Department of Computer Science and Engineering
Session: 2022-2023

Compiler Design Lab

PRACTICAL No. 5

Name: Gaurav Kedia **RollNo: 39** **Branch: AIML** **Batch: E2**

Topic: Three Address Code Generation

Platform: Windows or Linux

Language to be used: Python or Java (based on the companies targeted for placement)

CO Mapped: CO4- Learn three address code generation and implement code optimization techniques for improving the performance of a program segment.

Aim: Write a program to generate three address code for the given language construct using SDTS.

- **(a)** Batch E1: if-then-else,
- **(b)** Batch E2: for loop
- **(c)** Batch E3: while loop
- **(d)** Batch E4: do while loop

Input: Example for if-then-else

```
if (a<5)
{
        c= b+d
        d= i+j
}
else
{
         d= a+ b
        k= x+y

}
```

Output:

1) if (a<5) goto 3
2) Goto_8
3) T1=b+d
4) c=T1
5) T2=i+j
6) d=T2
7) goto__12_
8) T3=a+b
9) d=T3
10) T4=x+y
11) k=T4
12) END

Program:

```
def for_loop(cleaned_code):
  final_code = []
  for_index = None
  for i in range(len(cleaned_code)):
    codeline = cleaned_code[i]

    if 'for' in codeline:
      for_index = i
      start_index = codeline.index('(')
      end_index = codeline.index(')')

      bool_condn = ''.join(codeline[start_index:end_index + 1])

      final_code.append('if !{} goto({})'.format(bool_condn, None))
      for_index = i
    elif '}' in codeline:
      final_code.append('goto({})'.format(for_index + 1))

      final_code[for_index] = final_code[for_index].replace('None', str(i + 2))
      for_index = None
    else:
      final_code.append(codeline)
  return final_code


code = []
s = ""
print("Enter the number of statements which are present in for loop:")
n1 = int(input())

print("Enter the for statement:")
for i in range(0, n1):
  s = input()
  code.append(s)
print('The Statement is:')
print(code)

cleaned_code = []
for i in range(len(code)):
  if code[i] != '\n':
    if code[i][-1] == '\n':
      cleaned_code.append(code[i][:-1].strip())
    else:
      cleaned_code.append(code[i].strip())

intermediate_code = []
for i in range(len(cleaned_code)):
  codeline = cleaned_code[i]
  if 'for' in codeline:
    conditions = codeline[4:-2].split(';')
    initialization = conditions[0].strip()
    break_condn = conditions[1].strip()
    updations = conditions[2].strip().split(',')
```

```
    intermediate_code.append(initialization)
    intermediate_code.append('for(' + break_condn + '){')
  elif '}' in codeline:
    for updation in updations:
      intermediate_code.append(updation + ';')
    intermediate_code.append('}')
  else:
    intermediate_code.append(codeline)

final_code = for_loop(intermediate_code)

print('\nThe Three Address Code generated is:')
for i in range(len(final_code)):
  print(i + 1, ":", final_code[i])
```

OUTPUT:

```
Enter the number of statements which are present in for loop:
4
Enter the for statement:
for(int i=0;i<n;i++){
r=n%10;
n=n/10;
}
The Statement is:
['for(int i=0;i<n;i++){', 'r=n%10;', 'n=n/10;', '}']

The Three Address Code generated is:
1 : int i=0
2 : if !(i<n) goto(7)
3 : r=n%10;
4 : n=n/10;
5 : i++;
6 : goto(2)
```