
# COMPILER DESIGN LAB (CSL5404)

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Program: B.Tech CSE (5th Sem JUL-DEC 2021)

## Assignment - 9

# Question 1:

Q) Write a program to generate the three-address code for the following code of ‘if-else’, ‘for-loop’, and ‘while-loop’.

if-else code:

```
A = 1;
B = 2;
if (A<B)
  return 1;
else
  return 0;
```

## > Program Code

```
from prettytable import PrettyTable
x1 = PrettyTable()
code = open('if.txt','r')
lines = code.read().splitlines()
print('The Statement is :\n')
for i in lines:
  print('\t',i)
individual_lines = []
for entry in lines:
    x = []
    x = entry.split(" ")
    individual_lines.append(x)
goto,code1 = [],[]
for i in range(len(lines)):
    a = []
    if 'if' in lines[i]:
        a.append(lines[i])
        a.append('goto()')
        code1.append(a)
    elif 'return' in lines[i]:
```

```
        a.append('t1')
        a.append('=')
        a.append(individual_lines[i][-
1][:len(individual_lines[i][-1])-1])
        code1.append(a)
        if('if' in lines[i-1]):
            code1.append(['goto()'])
        else:
            goto.append(len(code1))
    elif 'else' not in lines[i]:
        a.append(lines[i])
        code1.append(a)
goto.append(len(code1)+1)
for i in range(len(code1)):
    if 'if' in code1[i][0]:
        code1[i][0] = code1[i][0].replace('A<B','!A<B')
j=-1
for i in range(len(code1)):
    if 'goto()' in code1[i][0]:
        j+=1
        code1[i][0] =
code1[i][0].replace('goto()','goto('+str(goto[j])+')')
    elif 'goto()' in code1[i][-1]:
        j+=1
        code1[i][-1] = code1[i][-
1].replace('goto()','goto('+str(goto[j])+')')
x1.field_names = ['Index','Code']
for i in range(len(code1)):
    code2 = ""
    for j in code1[i]:
        code2 += j
    x1.add_row([i+1,code2])
x1.add_row([len(code1)+1,"END"])
print('\n\nThe Three Address Code Generated is :')
print(x1)
```

# Output screenshot:

```
F:\Compiler Design\Lab\Assignments\Lakhan Kumawat\main.py
The Statement is :

        A = 1;
        B = 2;
        if (A<B)
          return 1;
        else
          return 0;


The Three Address Code Generated is :
+-------+--------------------+
| Index |        Code        |
+-------+--------------------+
|   1   |      A = 1;        |
|   2   |      B = 2;        |
|   3   | if (!A<B) goto(6)  |
|   4   |        t1=         |
|   5   |      goto(7)       |
|   6   |        t1=0        |
|   7   |        END         |
+-------+--------------------+
```

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# Question 2:

for-loop code:

```
a=3;
b=4;
n=6;
for(i=0;i<n;i++){
  a=b+1; a=a*a;
}
c=a;
```

## > Program Code

```
from prettytable import PrettyTable

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

        if 'while' in codeline:
            while_idx = i
            start_idx = codeline.index('(')
            end_idx = codeline.index(')')
            bool_condn = ''.join(codeline[start_idx:end_idx+1])
            final_code.append('if !{}
goto({})'.format(bool_condn,None))
            while_idx = i
        elif '}' in codeline:
            final_code.append('goto({})'.format(while_idx+1))
            final_code[while_idx] =
final_code[while_idx].replace('None',str(i+2))
            while_idx = None
        else:
            final_code.append(codeline)
    return final_code

with open('for-loop.txt') as f:
    code = f.readlines()
print('The Statement is:')
print(''.join(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('while(' + 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:')
x1 = PrettyTable()
x1.field_names = ['Index','Code']
for i in range(len(final_code)):
    x1.add_row([i+1,final_code[i]])
print(x1)
```

# Output screenshot:

```
F:\Compiler Design\Lab\Assignments\Lakhan Kumawat\main.py
The Statement is:
a=3;
b=4;
n=6;
for(i=0;i<n;i++){
  a=b+1; a=a*a;
}
c=a;


The Three Address Code generated is:
+-------+--------------------+
| Index |        Code        |
+-------+--------------------+
|   1   |        a=3;        |
|   2   |        b=4;        |
|   3   |        n=6;        |
|   4   |        i=0         |
|   5   | if !(i<n) goto(9)  |
|   6   |   a=b+1; a=a*a;    |
|   7   |        i++;        |
|   8   |      goto(5)       |
|   9   |        c=a;        |
+-------+--------------------+
```

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# Question 3:

while-loop code:

```
c = 0;
a = 1;
b = 2;
while(a < b){
  c = 1;
}
c = 0;
```

## > Program Code

```
from prettytable import PrettyTable

def while_loop(cleaned_code):
    final_code = []
    while_idx = None
    for i in range(len(cleaned_code)):
        codeline = cleaned_code[i]

        if 'while' in codeline:
            while_idx = i
            start_idx = codeline.index('(')
            end_idx = codeline.index(')')
            bool_condn = ''.join(codeline[start_idx:end_idx+1])
            final_code.append('if !{}
goto({})'.format(bool_condn,None))
            while_idx = i
        elif '}' in codeline:
            final_code.append('goto({})'.format(while_idx+1))
            final_code[while_idx] =
final_code[while_idx].replace('None',str(i+2))
            while_idx = None
        else:
            final_code.append(codeline)
    return final_code


with open('while-loop.txt') as f:
    code = f.readlines()

print('The Statement is:')
print(''.join(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())

final_code = while_loop(cleaned_code)
final_code.append('END')
print('\nThe Three Address Code Generated is:')
x1 = PrettyTable()
x1.field_names = ['Index','Code']
for i in range(len(final_code)):
    x1.add_row([i+1,final_code[i]])
print(x1)
```

# Output screenshot:

```
F:\Compiler Design\Lab\Assignments\Lakhan Kumawat\main.py
The Statement is:
c = 0;
a = 1;
b = 2;
while(a < b){
  c = 1;
}
c = 0;


The Three Address Code Generated is:
+-------+--------------------+
| Index |        Code        |
+-------+--------------------+
|   1   |       c = 0;       |
|   2   |       a = 1;       |
|   3   |       b = 2;       |
|   4   | if !(a < b) goto(7) |
|   5   |       c = 1;       |
|   6   |      goto(4)       |
|   7   |       c = 0;       |
|   8   |        END         |
+-------+--------------------+
```

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*End Of Assignment*