

Three address code

For expression $a = b * c + b * c$

Convert it to post-fix notation by using precedence of operation like

maximum precedence \uparrow
 $*/$

minimum precedence \downarrow -

precedence should be checked from left to right. parenthesis $()$ has a maximum precedence if it is present in the expression.

① $t_1 = b * c$

② $t_2 = b * c$

③ $t_3 = t_1 + t_2$

④ $a = t_3$

where t_1 , t_2 & t_3 are temporary variables.

Three address code for Control Statement

For all Control Statement like if else, while, do while, repeat until, for, we

used if condition only

For example

$a = 3;$

$b = 4;$

for ($i = 0; i < n; i++$)

$a = b + 1;$

$a = a * a;$

}

$c = a;$

The TAC is as follows

- ① $t_1 = 3;$
- ② $a = t_1;$
- ③ $t_2 = 4;$
- ④ $b = t_2;$
- ⑤ $t_3 = 0;$
- ⑥ $i = t_3$
- ⑦ $\text{if } (i < n) \text{ goto 11}$
- ⑧ $t_4 = a$
- ⑨ $c = t_4$
- ⑩ goto next
- ⑪ $t_5 = b + 1$
- ⑫ $a = t_5$
- ⑬ $t_6 = a * a$
- ⑭ $a = t_6$
- ⑮ $t_7 = i + 1$
- ⑯ $i = t_7$
- ⑰ goto 7

OR

- ① $a = 3$
- ② $b = 4$
- ③ $i = 0$
- ④ $\text{if } (i < n)$
 goto 7
- ⑤ $c = a$
- ⑥ goto next
- ⑦ $t_1 = b + 1$
- ⑧ $a = t_1$
- ⑨ $t_2 = a * a$
- ⑩ $a = t_2$
- ⑪ $t_3 = i + 1$
- ⑫ $i = t_3$
- ⑬ goto 4

Here $\text{if } (i < n)$ is true we may goto somewhere & for false just execute next statement goto next means jump out of the program.

Example 2:

```

a = 3;
b = 4;
i = 0;
while (i < n)
    a = b + 1;
    a = a * a;
    i++;
    c = a;

```

The TAC is as follows

- ① $a=3$
- ② $b=4$
- ③ $i=0$
- ④ $\text{if } (i < n) \text{ goto } 7$
- ⑤ $c=a$
- ⑥ goto next
- ⑦ $t_1 = b + 1;$
- ⑧ $a = t_1$
- ⑨ $t_2 = a \times a$
- ⑩ $a = t_2$
- ⑪ $t_3 = i + 1$
- ⑫ $i = t_3$
- ⑬ $\text{goto } 4$

Example 3

$$a=3$$

$$b=4$$

$$i=0$$

do {

$$a = b + 1;$$

$$a = a \times a;$$

$$i++$$

}

while ($i < n$)

$$c = a;$$

The TAC is as follows;

- | | |
|------------------|---|
| ① $a=3$ | ⑥ $t_2 = a \times a$ |
| ② $b=4$ | ⑦ $a = t_2$ |
| ③ $i=0$ | ⑧ $t_3 = i + 1$ |
| ④ $t_1 = b + 1;$ | ⑨ $i = t_3$ |
| ⑤ $a = t_1$ | ⑩ $\text{if } (i < n) \text{ goto } 13$ |

- ⑪ $c = a;$
- ⑫ go to next;
- ⑬ go to 4;

Example 4 $n=3$
 $b=4$
 $i=0$
 repeat {
 $a = b + 1;$
 $a = a * a;$
 $i++;$ }
 until $(i < n)$
 $c = a;$

The TAC is

- ① $a = 3$
- ② $b = 4$
- ③ $i = 0$
- ④ $t_1 = b + 1;$
- ⑤ $a = t_1;$
- ⑥ $t_2 = a * a;$
- ⑦ $a = t_2$
- ⑧ $t_3 = i + 1$
- ⑨ $i = t_3$
- ⑩ if $(i < n)$ go to 12
- ⑪ ~~$c = a;$~~
- ⑫ ~~go to next~~
- ⑬ go to 4
- ⑭ $c = a;$
- ⑮ go to next;

Assignments

Q.1. Construct the TAC for the following Code Segment For ($i=1$ to n)

```
{
  j = 1;
  While (j <= n)
  {
    a = b * c / d;
    j = j + 1;
  }
}
```

Q.2 Construct the three address code for the following Code Segment?

```
if (a < b + c * 20)
{
```

```
  a = a * b - 50;
```

```
  d = (a / b) + 25;
```

```
}
```

Q.3 Construct the TAC for the following expression

① $w = (A + B) - (C + D) + (A + B + C)$

② $a = (a + b * c) \uparrow (b * c) + b * c \uparrow a$