Compilers

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CSE-D
305

Code-1:

```
B1:  i = m-1
     j = n
     t1 = 4*n
     v = a[t1]
```

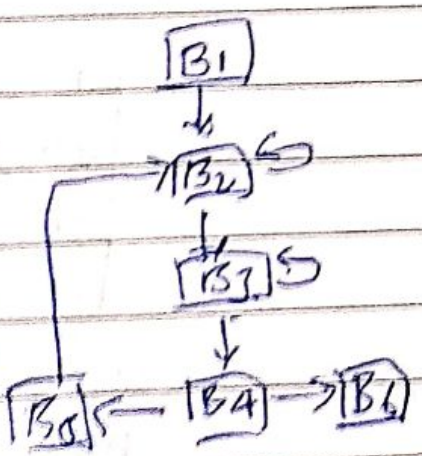
```
B2:  i = i+1
     t2 = 4*i
     t3 = a[t2]
     if t3 < v goto B2
```

```
B3:  j = j-1
     t4 = 4*j
     t5 = a[t4]
     if t5 > v goto B3
```

```
B4:  if i >= j goto B6
```

```
B5:  t6 = 4*i
     x = a[t6]
     t7 = 4*i
     t8 = 4*j
     t9 = a[t8]
     a[t7] = t9
     t10 = 4*j
     a[t10] = x
     goto B2
```

```
B6:  t11 = 4*1
     t = a[t11]
     t12 = 4*i
     t13 = 4*n
     t14 = a[t13]
     a[t12] = t14
     t15 = 4*n
     a[t15] = t
```



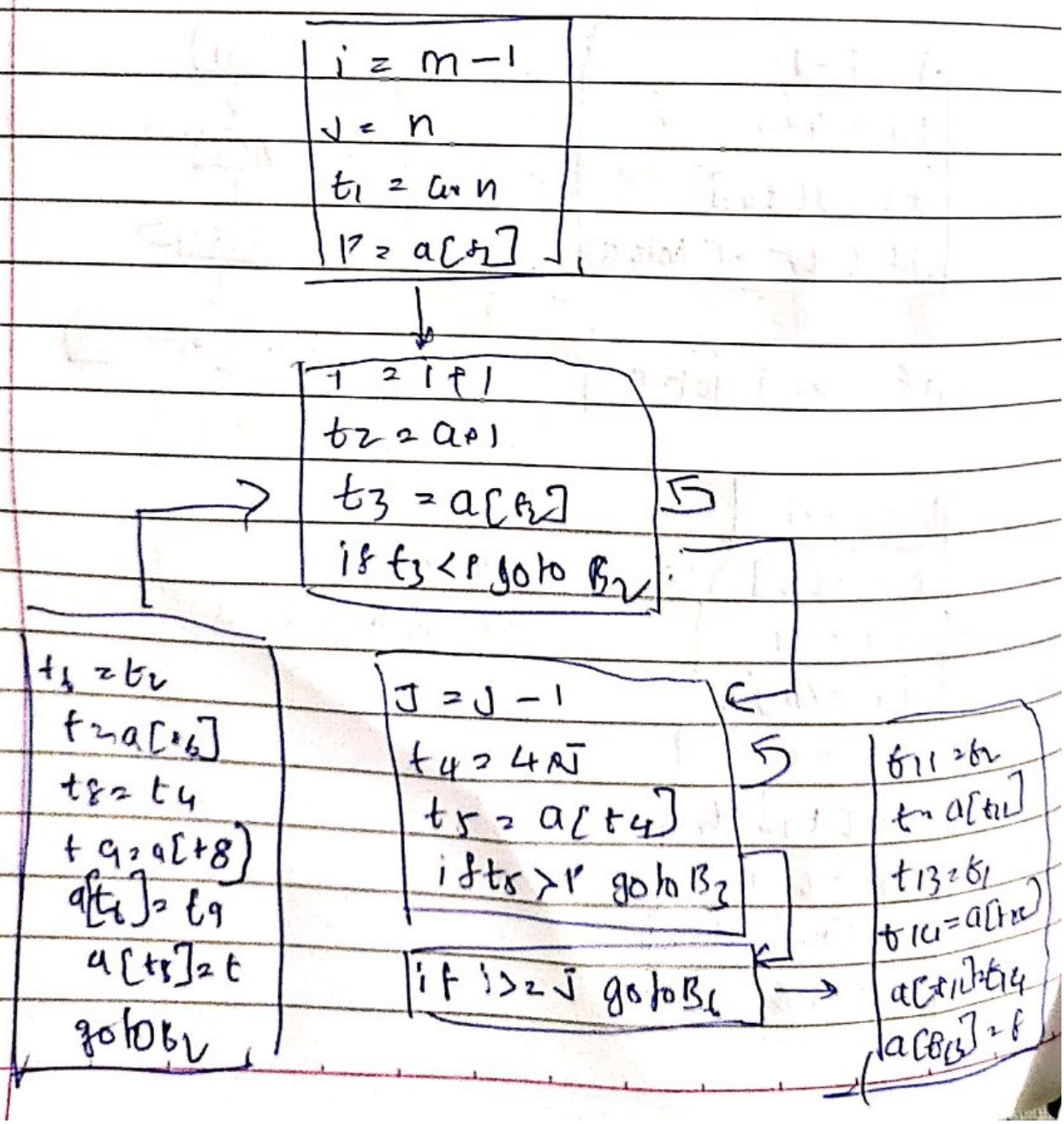
Replacing goto with Blocknos

Dead code elimination for t_7 to t_{12} t_{15}

$t_6 = 4 * i$
$t = a[t_6]$
$t_8 = 4 * i$
$t_9 = a[t_8]$
$a[t_6] = t_9$
$a[t_8] = t$
goto B2

$t_{11} = 4 * j$
$t = a[t_{11}]$
$t_{13} = 4 * n$
$t_{14} = a[t_{13}]$
$a[t_{11}] = t_{14}$
$a[t_{13}] = t$

Global Common Subexpression elimination



Copy propagation on t_6 t_8 t_{11} t_{13}

$t_6 = t_2$
$t = a[t_2]$
$t_8 = t_4$
$t_9 = a[t_4]$
$a[t_2] = t_9$
$a[t_4] = t$
goto B_2

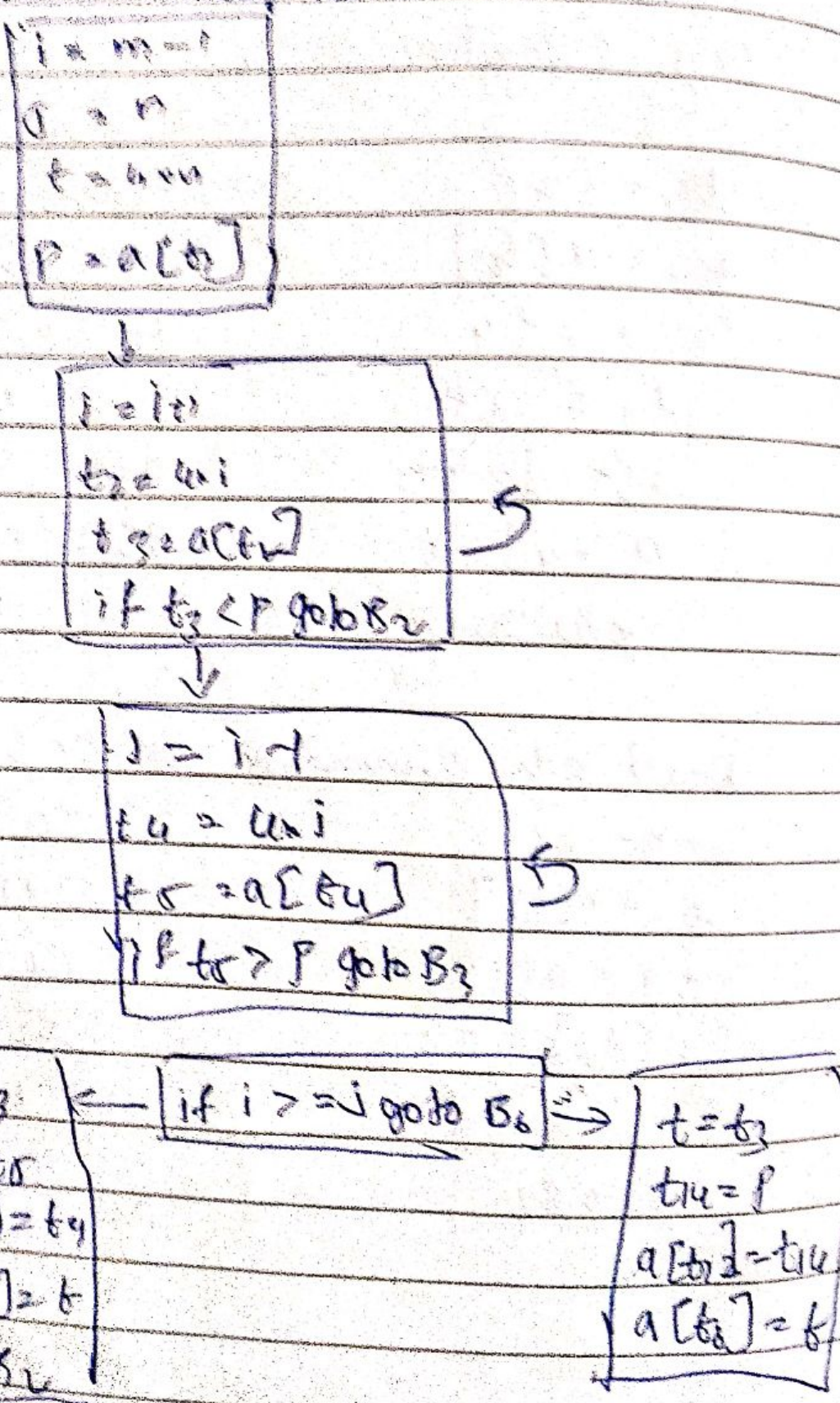
$t_{11} = t_2$
$t = a[t_2]$
$t_{13} = t_1$
$t_{14} = a[t_1]$
$a[t_2] = t_{14}$
$a[t_1] = t$

Dead code elimination on t_6 t_8 t_{11} t_{13}

B_5
$t = a[t_2]$
$t_9 = a[t_4]$
$a[t_2] = t_9$
$a[t_4] = t$
goto B_2

B_6
$t = a[t_2]$
$t_{14} = a[t_1]$
$a[t_2] = t_{14}$
$a[t_1] = t$

Global Common Subexpression elimination



· Copy propagation on t_2, t_9, t_{14}

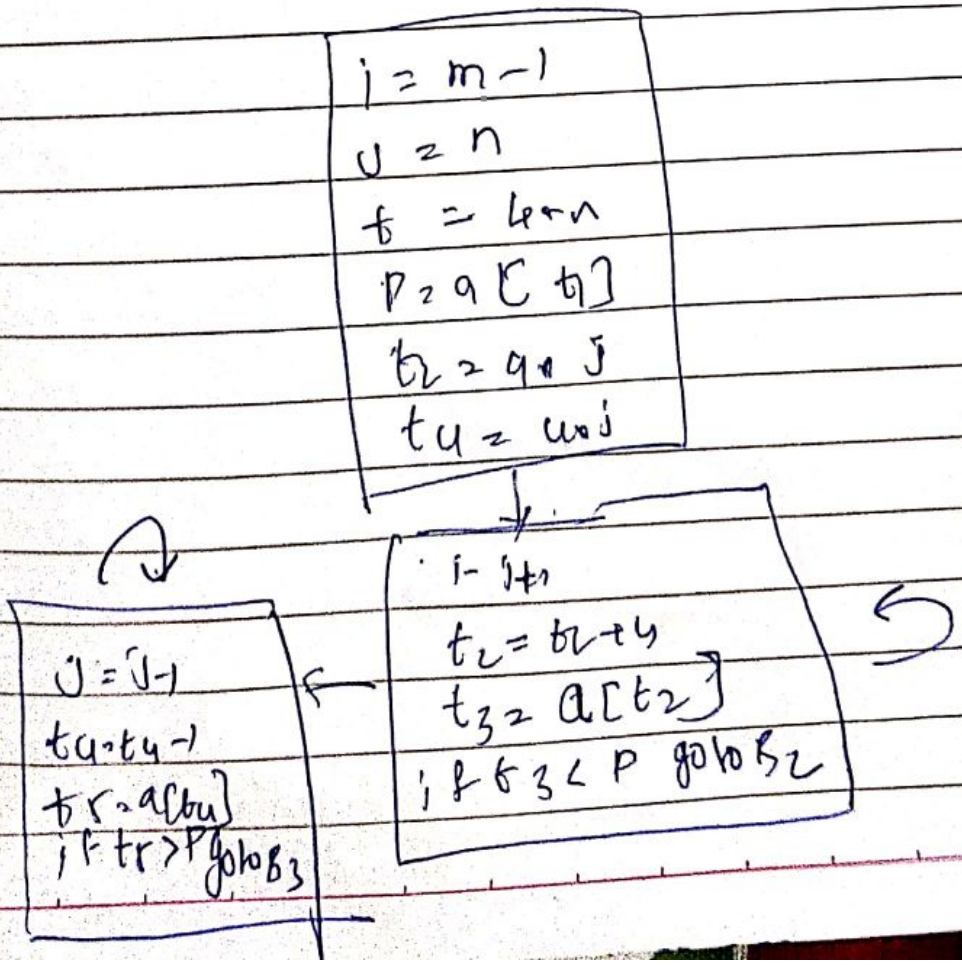
B_5	B_6
$t_2 = t_3$	$t = t_3$
$t_9 = t_5$	$t_{14} = P$
$a[t_2] = t_3$	$a[t_2] = P$
goto B_2	$a[t_1] = t_3$

Dead code elimination on t_2, t_9, t_{14}

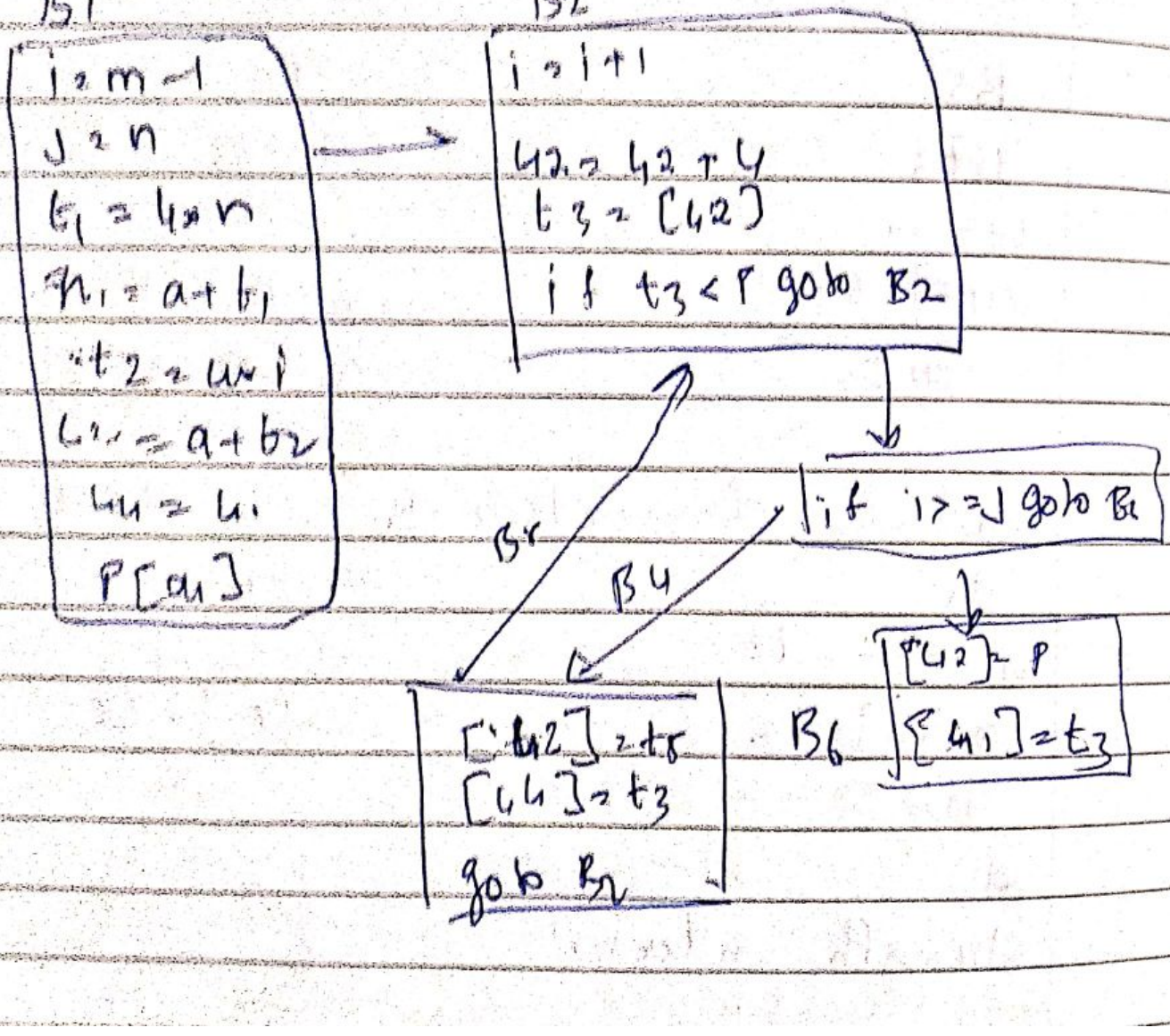
B_5	B_6
$a[t_2] = t_5$	$a[t_2] = P$
$a[t_{11}] = t_3$	$a[t_1] = t_3$
goto B_2	

(8)

Strength reduction



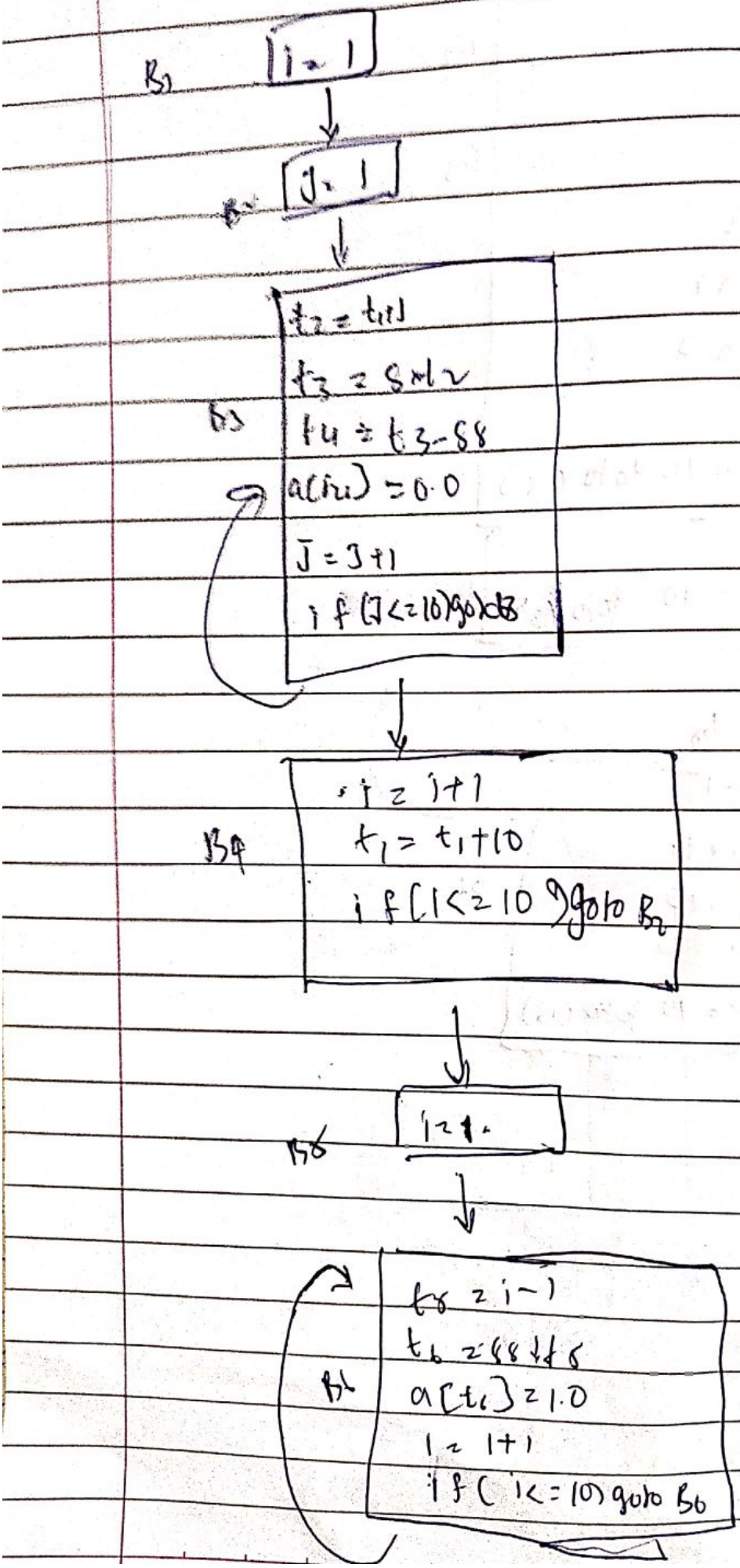
Induction variables



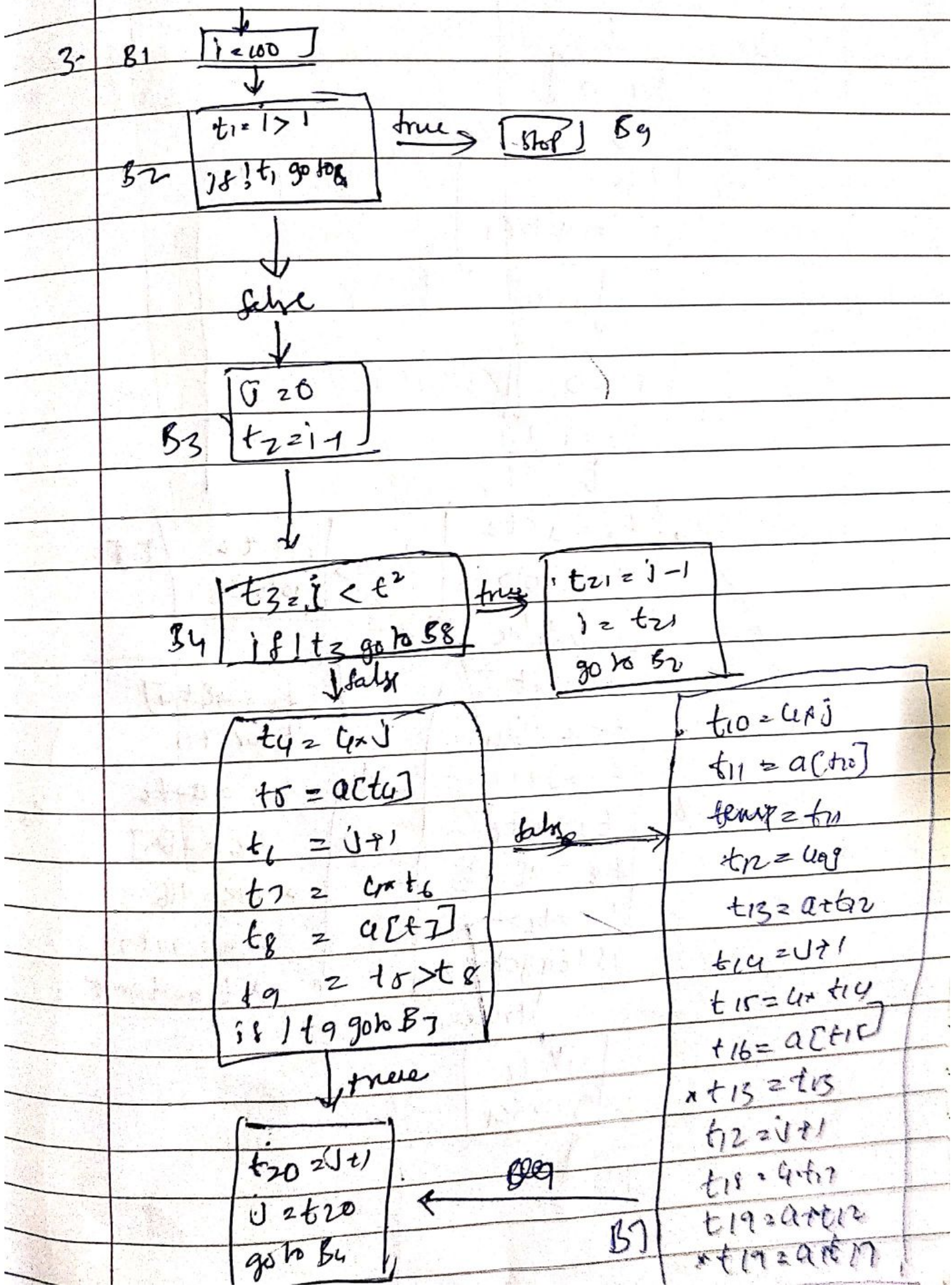
Code 2

```
1)  i = 1                          B1
2)  j = 1                          B2
3)  t1 = 10 * i                    B3
4)  t2 = t1 + j
5)  t3 = 8 * t2
6)  t4 = t3 - 88
7)  a[t4] = 0.0
8)  j = j + 1
9)  if j <= 10 goto (3)
10) i = i + 1                      B4
11) if i <= 10 goto (3)
12) i = 1                          B5
13) t5 = i - 1                     B6
14) t6 = for t5
15) a[t6] = 10
16) i = i + 1
17) if i <= 10 goto (13)
```

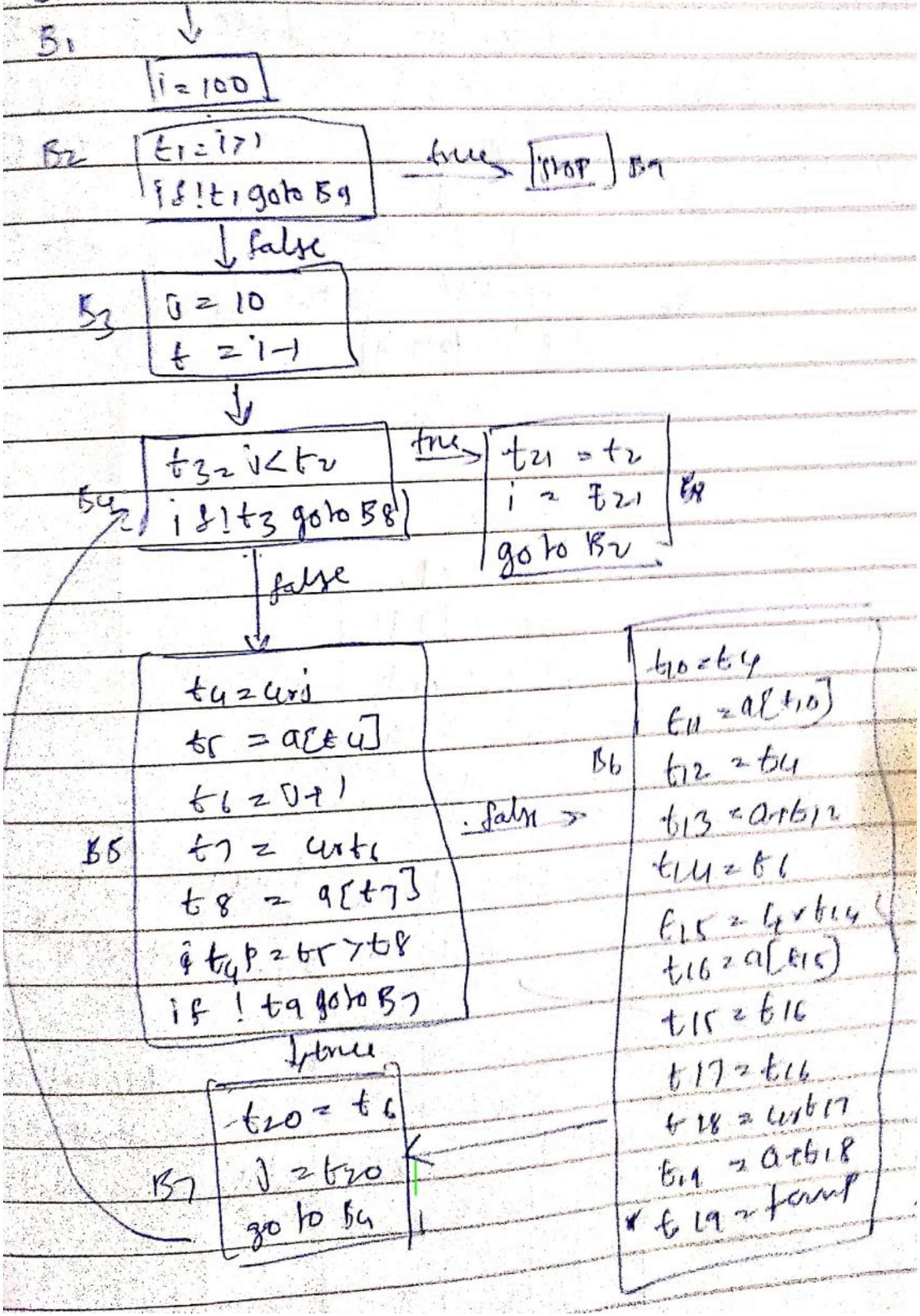
after eliminating Induced variable



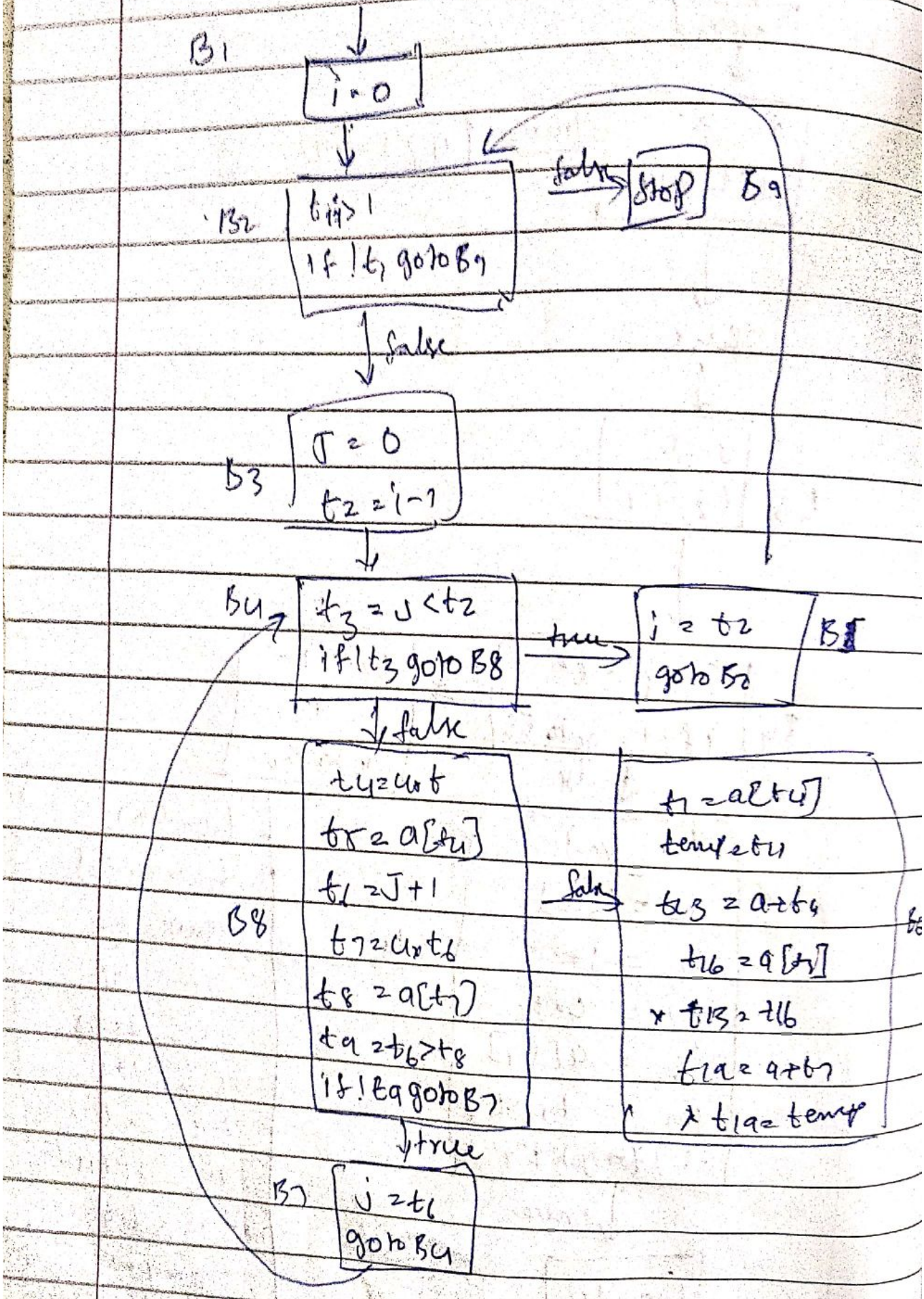
Code-3



Global Common Sub - exp elimination



GCSE and Copy Propagation



I V detection and CSE triples for I.V

(Induction variables).

j = (j, i, 0)

t4 = (j, 4, 0)

t6 = (j, 1, 1)

t7 = (j, 4, 4)