7

101830245

2020   11   27

1

$$S$$
$$do\ S^{(1)}\ while(E);$$
$$do\ S^{(1)}\ while(E^{(1)}\ \&\&\ D);$$
$$do\ S^{(1)}\ while(E^{(1)}\ \&\&\ D^{(1)} < C);$$
$$do\ S^{(1)}\ while(E^{(1)}\ \&\&\ D^{(1)} < x1);$$
$$do\ S^{(1)}\ while(E^{(1)}\ \&\&\ C < x1);$$
$$do\ S^{(1)}\ while(E^{(1)}\ \&\&\ x7 < x1);$$
$$do\ S^{(1)}\ while(D\ \&\&\ x7 < x1);$$
$$do\ S^{(1)}\ while(D^{(1)} < C\ \&\&\ x7 < x1);$$
$$do\ S^{(1)}\ while(D^{(1)} < C^{(1)} - x6\ \&\&\ x7 < x1);$$
$$do\ S^{(1)}\ while(D^{(1)} < C^{(1)} - x6\ \&\&\ x7 < x1);$$
$$do\ S^{(1)}\ while(D^{(1)} < x1 - x6\ \&\&\ x7 < x1);$$
$$do\ S^{(1)}\ while(C < x1 - x6\ \&\&\ x7 < x1);$$
$$do\ S^{(1)}\ while(x5 < x1 - x6\ \&\&\ x7 < x1);$$
$$do\ if\ (E)\ S^{(2)}\ else\ S^{(3)}\ while(x5 < x1 - x6\ \&\&\ x7 < x1);$$
$$do\ if\ (E)\ S^{(2)}\ else\ x2 = E;\ while(x5 < x1 - x6\ \&\&\ x7 < x1);$$
$$do\ if\ (E)\ S^{(2)}\ else\ x2 = D;\ while(x5 < x1 - x6\ \&\&\ x7 < x1);$$
$$do\ if\ (E)\ S^{(2)}\ else\ x2 = C;\ while(x5 < x1 - x6\ \&\&\ x7 < x1);$$
$$do\ if\ (E)\ S^{(2)}\ else\ x2 = C^{(1)} - x4;\ while(x5 < x1 - x6\ \&\&\ x7 < x1);$$
$$do\ if\ (E)\ x1 = E;\ else\ x2 = x2 - x4;\ while(x5 < x1 - x6\ \&\&\ x7 < x1);$$
$$do\ if\ (E)\ x1 = D;\ else\ x2 = x2 - x4;\ while(x5 < x1 - x6\ \&\&\ x7 < x1);$$

$do\ if\ (E)\ x1 = C;\ else\ x2 = x2 - x4;\ while(x5 < x1 - x6\ \&\&\ x7 < x1);$

$do\ if\ (E)\ x1 = C^{(1)} - x3;\ else\ x2 = x2 - x4;\ while(x5 < x1 - x6\ \&\&\ x7 < x1);$

$do\ if\ (E)\ x1 = x1 - x3;\ else\ x2 = x2 - x4;\ while(x5 < x1 - x6\ \&\&\ x7 < x1);$

$do\ if\ (E)\ x1 = x1 - x3;\ else\ x2 = x2 - x4;\ while(x5 < x1 - x6\ \&\&\ x7 < x1);$

$do\ if\ (D)\ x1 = x1 - x3;\ else\ x2 = x2 - x4;\ while(x5 < x1 - x6\ \&\&\ x7 < x1);$

$do\ if\ (D^{(1)} < C)\ x1 = x1 - x3;\ else\ x2 = x2 - x4;\ while(x5 < x1 - x6\ \&\&\ x7 < x1);$

$do\ if\ (D^{(1)} < x2)\ x1 = x1 - x3;\ else\ x2 = x2 - x4;\ while(x5 < x1 - x6\ \&\&\ x7 < x1);$

$do\ if\ (C < x2)\ x1 = x1 - x3;\ else\ x2 = x2 - x4;\ while(x5 < x1 - x6\ \&\&\ x7 < x1);$

$do\ if\ (x1 < x2)\ x1 = x1 - x3;\ else\ x2 = x2 - x4;\ while(x5 < x1 - x6\ \&\&\ x7 < x1);$

2

97 965 98752 98752 3 97 9865 97 964 1

3

(i)

$S \to do$

$$\{newLabel(\&S.label); \ generate(S.label :); \}$$

$S^{(1)}while(E);$

$$\{generate(if, E.var, goto, S.label); \}$$

(ii)

$S \to id = E;$

$$\{generate(id.val, =, E.var); \}$$

(iii)

$S \to if \ (E)$

$$\{newLabel(\&S.label_1); \ generate(if \ not, E.var, goto, S.label_1); \}$$

$S^{(1)}$

$$\{newLabel(\&S.label_2); \ generate(goto, S.label2); \ generate(S.label_1); \}$$

$else \ S^{(2)}$

$$\{generate(S^{(2)}.var); \ generate(S.label_2); \}$$

(iv)

$E \to E^{(1)}\&\&D$

$$\{newTmp(\&E.var); generate(E.var, =, E^{(1)}.var, \&\&, D.var); \}$$

(v)

$E \to D$

$$\{newTmp(\&E.var); generate(E.var, =, D.var); \}$$

(vi)

$D \to D^{(1)} < C$

$$\{newTmp(\&D.var); generate(D.var, =, D^{(1)}.var, <, C.var); \}$$

(vii)

$D \to C$

$$\{newTmp(\&D.var); generate(D.var, =, C.var); \}$$

(viii)
$$C \to C^{(1)} - id$$
$$\{newTmp(\&C.var); generate(C.var, =, C^{(1)}.var, -, id.val);\}$$

(ix)
$$C \to id$$
$$\{newTmp(\&C.var); generate(C.var, =, id.val);\}$$

4

		1	3

```
 1   l1:
 2   t1=x1
 3   t2=t1
 4   t3=x2
 5   t4=t2<t3
 6   t5=t4
 7   if not t5 goto l2
 8   t6=x1
 9   t7=t6-x3
10   t8=t7
11   t9=t8
12   x1=t9
13   goto l3
14   l2:
15   t10=x2
16   t11=t10-x4
17   t12=t11
18   t13=t12
19   x2=t13
20   l3:
21   t14=x5
22   t15=t14
23   t16=x1
24   t17=t16-x6
25   t18=t15<t17
26   t19=t18
27   t20=x7
28   t21=t20
29   t22=x1
30   t23=t21<t22
31   t24=t19 && t23
```

```
32    if t24 goto l1
```