

Solution

Problem 1: (24 points)

1.

FloatPoint **Digits . (Digits)? (Exponent)? (TypeSuffix)? |**
 . Digits (Exponent)? (TypeSuffix)? |

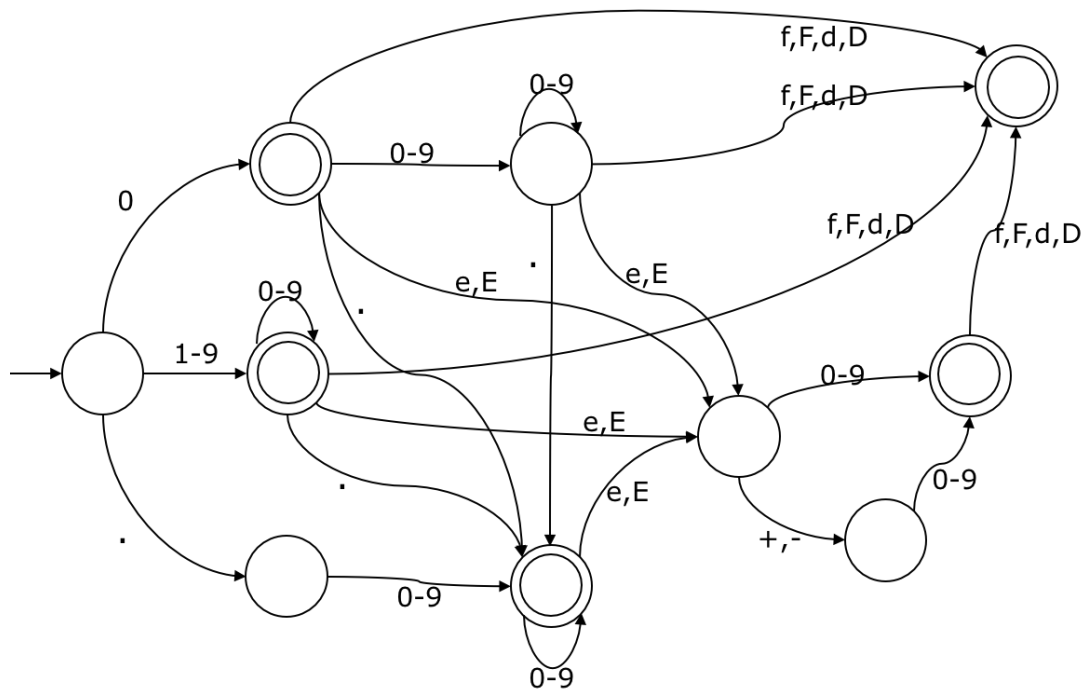
Digits Exponent (TypeSuffix)?

Digits (Exponent)? TypeSuffix

Exponent **(e|E) (+|-)? Digits**

TypeSuffix **f | F | d | D**

2.

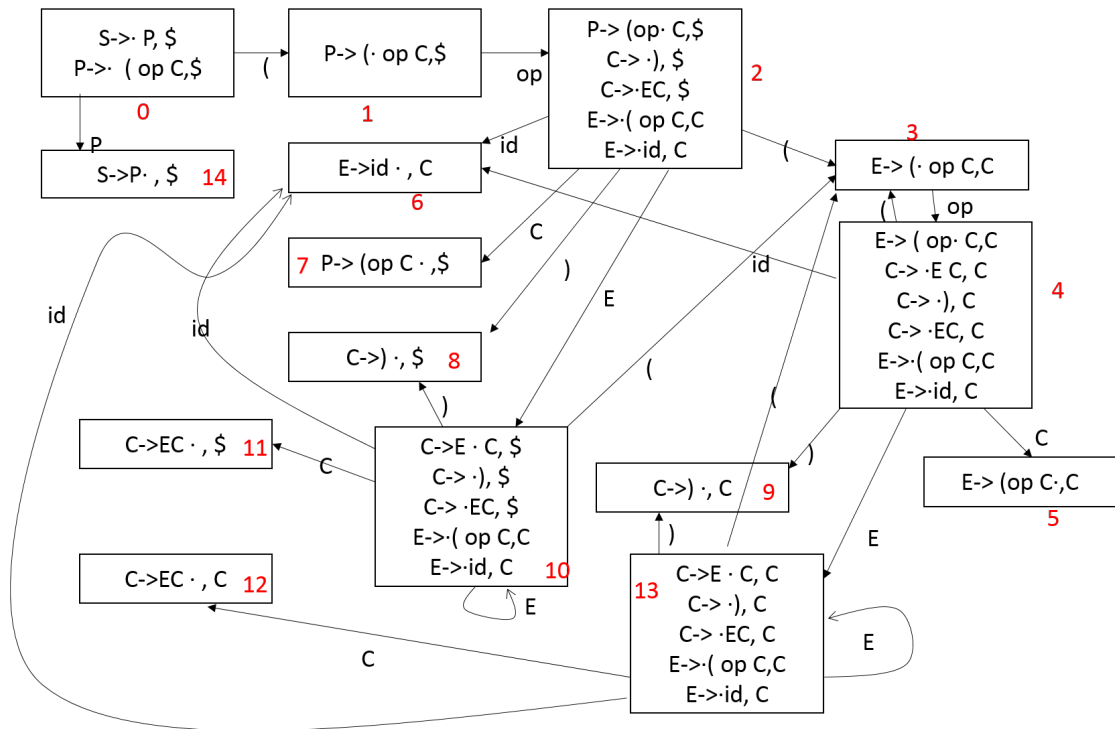


3

output: 315242524253332515

Problem 2: (30 points)

1.



Note: $\text{first}(C) = \{ (,), id \}$

2.

	\$	()	id	op	P	C	E
0		S 1				G 14		
1					S 2			
2		S 3	S 8	S 6			G 7	G 10
3					S 4			
4		S 3	S 9	S 6			G 5	G 13
5		R 4	R 4	R 4				
6		R 5	R 5	R 5				
7	R 1							
8	R 2							
9		R 2	R 2	R 2				
10		S 3	S 8	S 6			G 11	G 10
11	R 3							
12		R 3	R 3	R 3				
13		S 3	S 9	S 6			G 12	G 13
14	A							

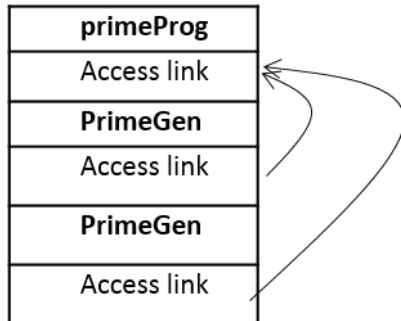
3.

Stack	Action
	S 3
(op id	R 5
(op E	S 3
(op E (op)	R 2
(op E (op C	R 4
(op E E	S 3
(op E E (op id	R 5
(op E E (op E	S 1
(op E E (op E)	R 2
(op E E (op E C	R 3
(op E E (op C	R 4
(op E E E	S 1
(op E E E)	R 2
(op E E E C	R 3
(op E E C	R 3
(op E C	R 3
(op C	R 1
P	S 1
P\$	accept

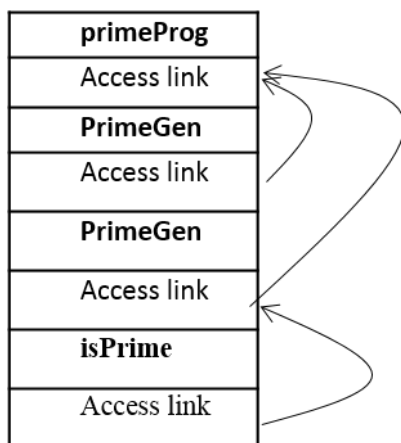
Problem 3: (18 points)

1.

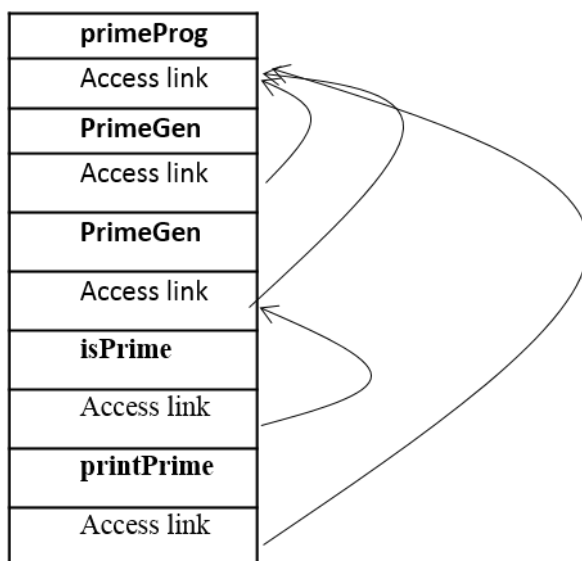
(1)



(2)

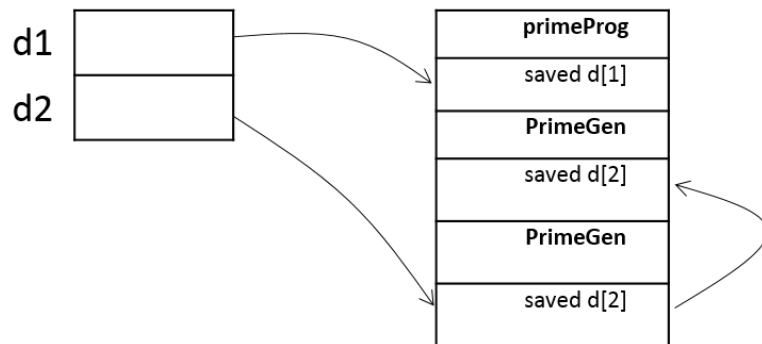


(3)

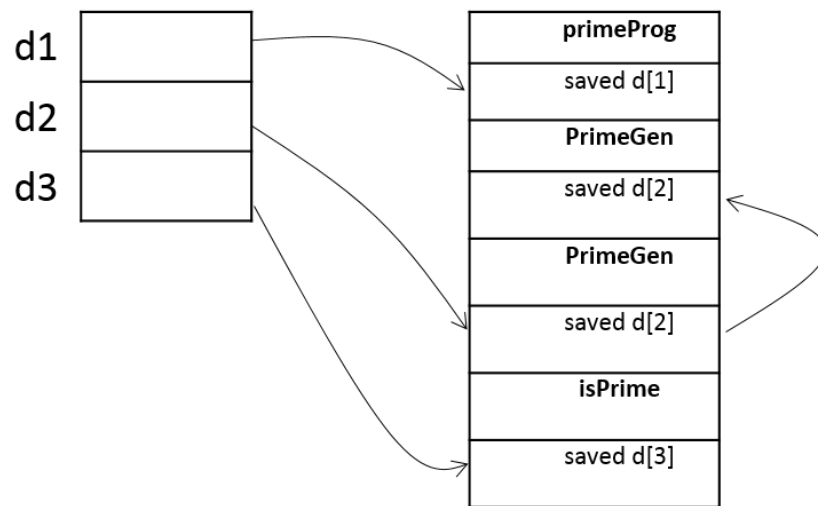


2.

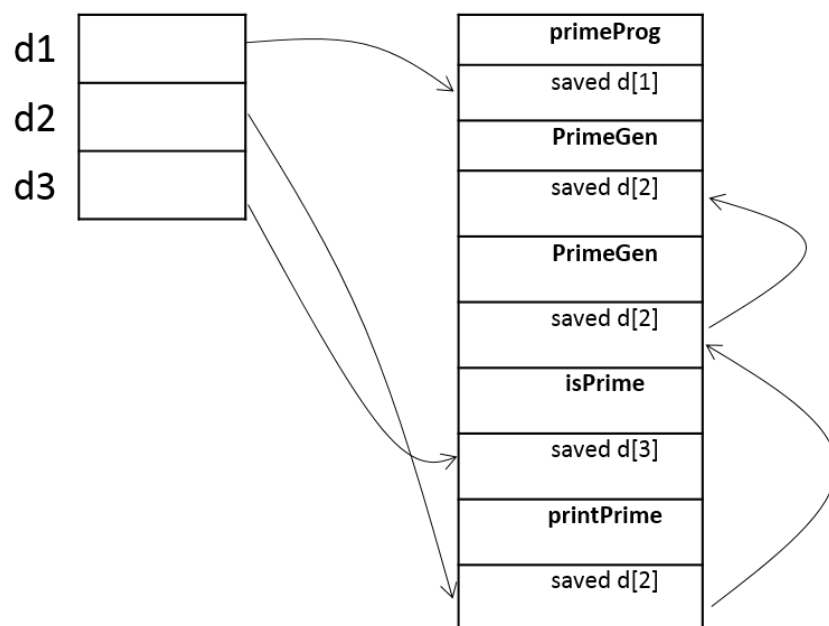
(1)



(2)

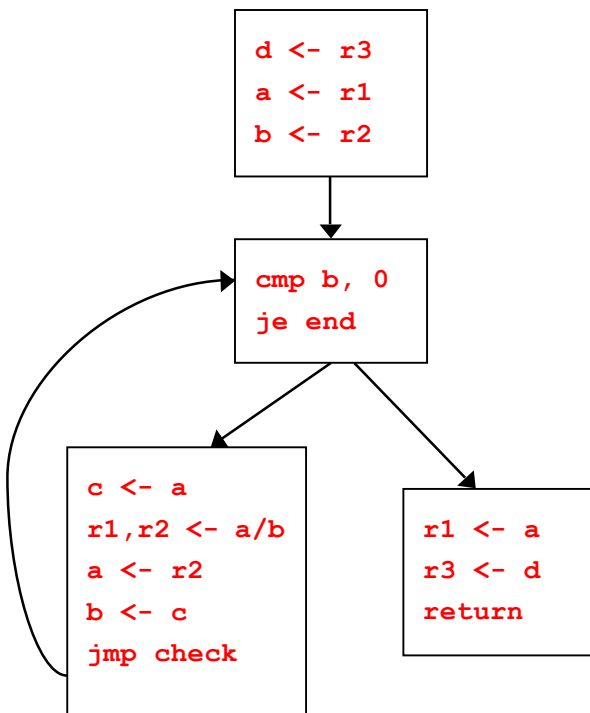


(3)



Problem 4: (28 points)

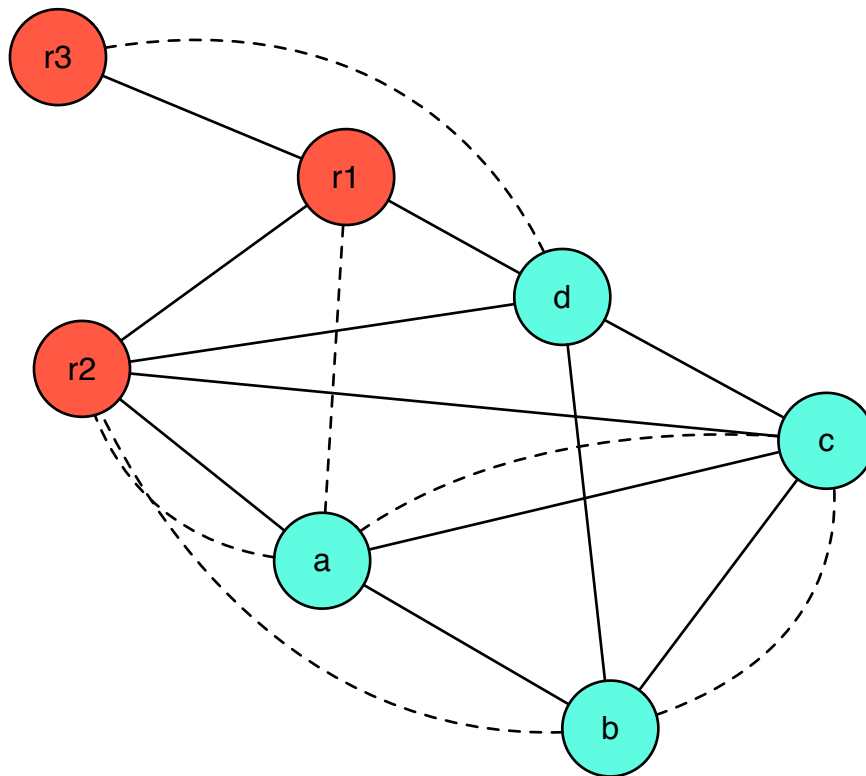
1.



2.

instr	def	use	in	out
d <- r3	d	r3	r1, r2, r3	r1, r2, d
a <- r1	a	r1	r1, r2, d	r2, a, d
b <- r2	b	r2	r2, a, d	a, b, d
cmp b, 0	-	b	a, b, d	a, b, d
je ret	-	-	a, b, d	a, b, d
c <- a	c	a	a, b, d	a, b, c, d
r1, r2 <- a/b	r1, r2	a, b	a, b, c, d	c, d, r2
a <- r2	a	r2	c, d, r2	c, a, d
b <- c	b	c	c, a, d	a, b, d
jmp check	-	-	a, b, d	a, b, d
r1 <- a	r1	a	a, d	d, r1
r3 <- d	r3	d	d, r1	r1, r3
return	-	-	r1, r3	r1, r3

3.



4.

```
gcd:  M[loc(d)] <- r3
check: cmp r2,0
      je end
loop: r3 <- r1
      r1,r2 <- r1/r2
      r1 <- r2
      r2 <- r3
      jmp check
end:  r3 <- M[loc(d)]
      return
```