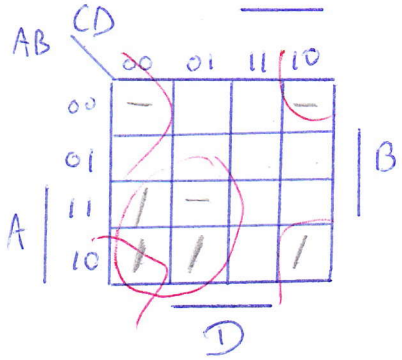
1) F



$$F = A \cdot \overline{C} + \overline{B} \cdot \overline{D}$$

2) $\varphi 1$: Mealy
$\varphi 2$: 4

3) Fraction $1.\underbrace{xxxx\ldots x}_{21\ bits}$ $\Rightarrow$ decimal value ≥ 1 and < 2

$9 = \frac{9}{8} \times 8$, $8 = 2^3$

$27 \uparrow \geq 1$

Fraction 1001 $\Rightarrow$ bitpattern 001000 ... 0

Exponent $3 + 15 = 18_{10}$ $\Rightarrow$ bitpattern 00000 10010

Sign. bit 1

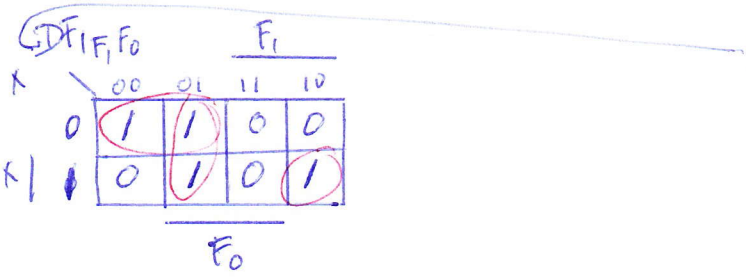
4)

Present state		next state $\bar{X}$		next state X		output
F_1	F_0	F_1^+	F_0^+	F_1^+	F_0^+	
0	0	1	1	0	1	0
0	1	1	0	1	0	0
1	0	0	1	1	1	0
1	1	0	0	0	0	1

$\Rightarrow$

X	F_1	F_0	F_1^+	F_0^+	Z
0	0	0	1	1	0
0	0	1	1	0	0
0	1	0	0	1	0
0	1	1	0	0	1
1	0	0	0	1	0
1	0	1	1	0	0
1	1	0	1	1	0
1	1	1	0	0	1

$\downarrow$ DF_1



Q1: $DF_1 = \bar{X} \cdot \bar{F_1} + \bar{F_1} \cdot F_0 + X \cdot F_1 \cdot \bar{F_0}$

Q2: $Z = F_1 \cdot F_0$

5) SRL %R1, 10, %R3

$\underbrace{1000}_{8}\ \underbrace{0111}_{7}\ \underbrace{0011}_{3}\ \underbrace{0000}_{0}\ \underbrace{0110}_{6}\ \underbrace{0000}_{0}\ \underbrace{0000}_{0}\ \underbrace{1010}_{A}$

$873\phi 6\phi\phi A_{16}$

6)

```
        .begin
        .org 0
        sethi arr1, %r1
        srl %r1,10,%r1      ! %r1 begin address arr1 (source)
        sethi arr2, %r2
        srl %r2,10,%r2      ! %r2 begin address arr2 (destination)
loop:   ld[%r1], %r3        ! element of array in %r3
        addcc %r3,%r0,%r0   ! check status; result in %r0 (no change)
        be ready
        bneg skip           ! skip negative number
        st %r3, %r2         ! copy element
        addcc %r2,4,%r2     ! next address in arr2
skip:   addcc %r1,4,%r1     ! next address in arr1
        ba loop
ready:  st %r0, %r2         ! write terminating 0
        halt
        .org 100
arr1:   12, -4, 9, 8, -23, 9, 0
        .org 200
arr2:
        .end
```

7) RTL of micro instruction

500: %temp0 ← ORN (%R0, %~~temp0~~ R0)

501: %R0 ← ADDCC (%temp0, %R0)

502: %temp2 ← INC (%temp0)

	init	after 500	after 501	after 502
%R0	0	0	0	0
%temp0	10	1111...1$_2$	1111...1$_2$	1111...1$_2$
%temp1	20	20	20	20
%temp2	30	30	30	0