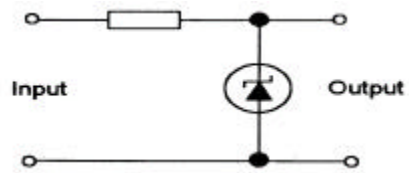


### 3.3

: 가 가 ,

1. 가,

2. (zener diode) ,



3.16

【      】

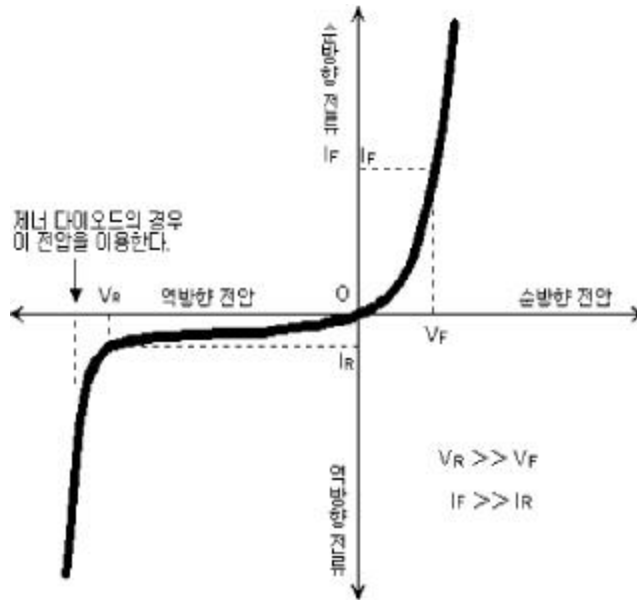


: " " 가 " " ,

가 , ,

ON / OFF





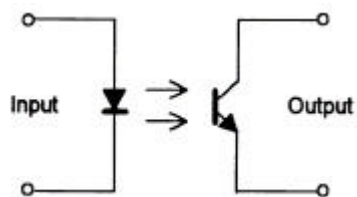
【           】

breakdown

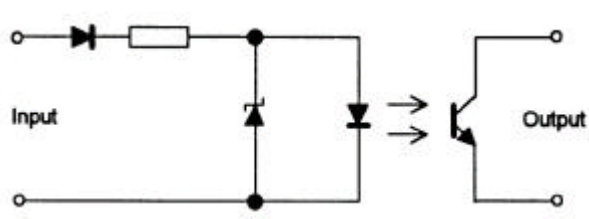
가  
가  
가  
가

3.

ex - (optoisolator) -

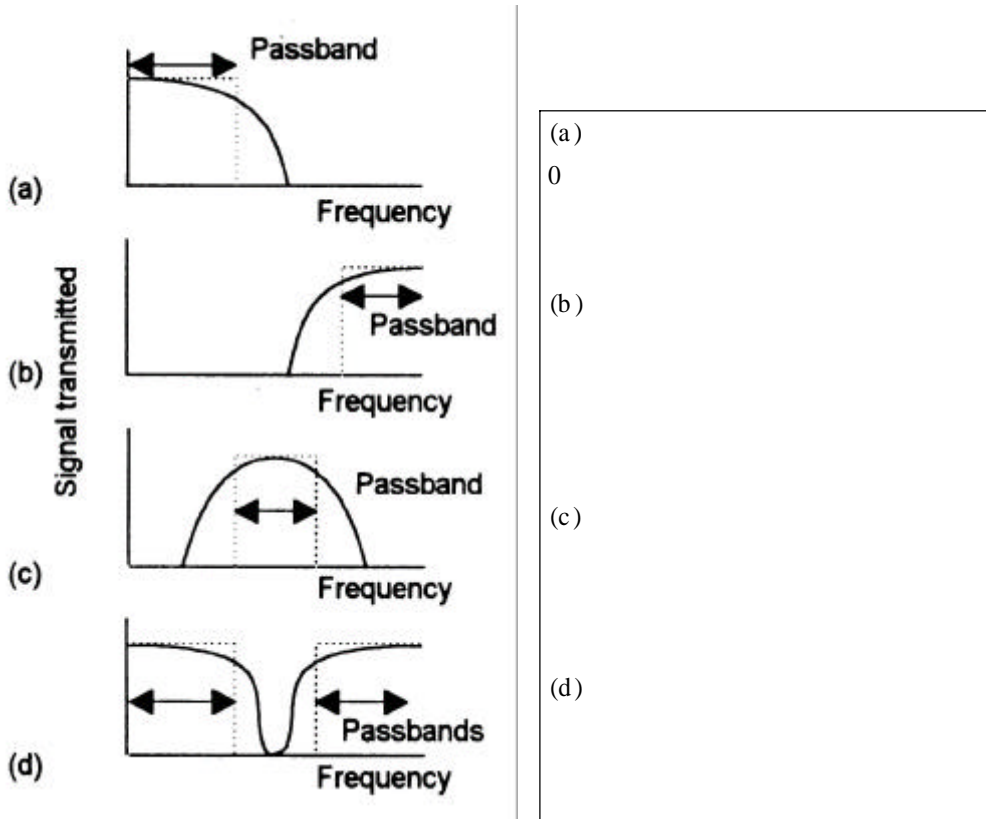


(LED)  
(phototransistor)



3.18

### 3.4

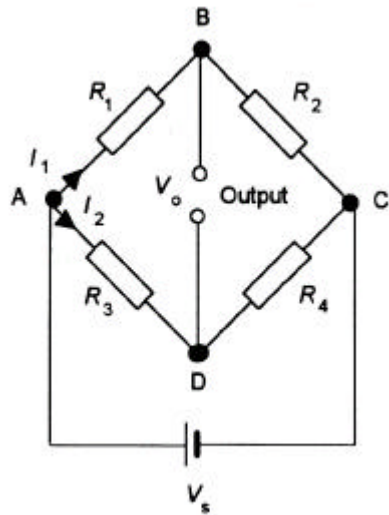


70.7%

가

가

### 3.5 (Wheatstone bridge)



$R_1 R_4 = R_2 R_3$

· AB

$$V_{AB} = \frac{V_s R_1}{R_1 + R_3}$$

· AD

$$V_{AD} = \frac{V_s R_3}{R_1 + R_3}$$

BD 
$$V_{AD} = \frac{V_s R_3}{R_1 + R_3}$$

$$V_o = V_{AB} - V_{AD} = V_s \left( \frac{R_1}{R_1 + R_3} - \frac{R_3}{R_1 + R_3} \right) \tag{a}$$

$R_1$

$R_1 \quad R_1 + \delta R_1$

$$V_o + \delta V_o = V_s \left( \frac{R_1 + \delta R_1}{R_1 + \delta R_1 + R_3} - \frac{R_3}{R_1 + R_3} \right) \tag{b}$$

$\delta R_1 \quad R_1$

가 , (a)-(b)

$$\delta V_o \approx V_s \left( \frac{\delta R_1}{R_1 + R_3} \right)$$

.

가

ex) 0      100

가

100

가 0.0039/K

1

?

6V

)

$$R_t = R_0(1 + \alpha t)$$

$\alpha$

$$= R_t - R_0 = R_0 \alpha t = 100 \times 0.0039 \times 1 = 0.39 \Omega / K$$

$$\delta V_o \approx V_s \left( \frac{\delta R_1}{R_1 + R_3} \right) = \frac{6.0 \times 0.39}{100 + 100} = 0.012 V$$

### 3.5.1

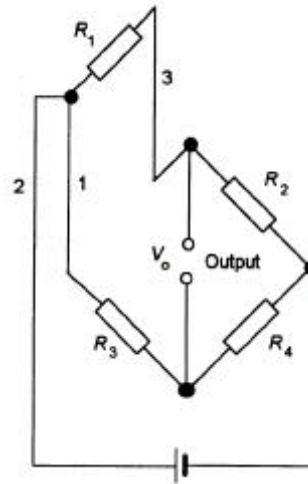
가

: 3

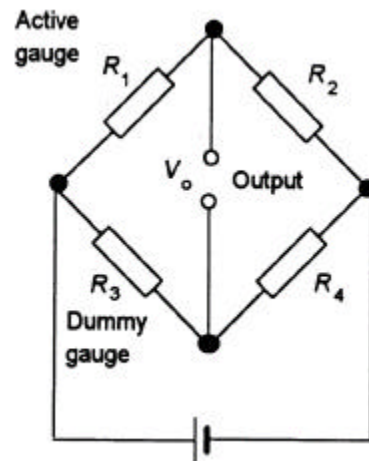
3

가

$R_1$   $R_3$ 가



가



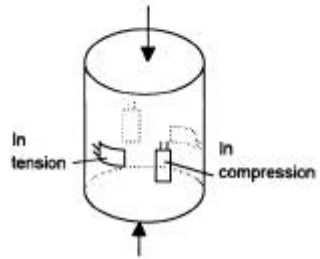
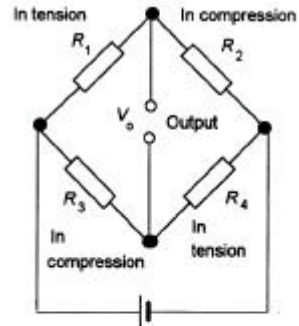
: 4

2

가

4

가



### 3.5.2

:

0

가



0

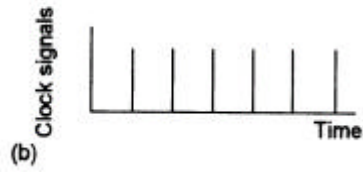
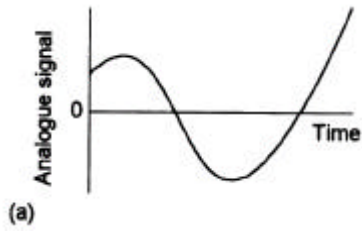
### 3.6

### 3.6.1

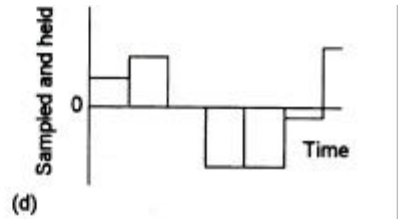
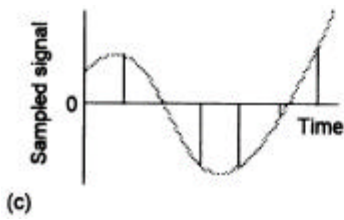
(Analogue-Digital Conversion: ADC)

( )

⇒ ( 2 )

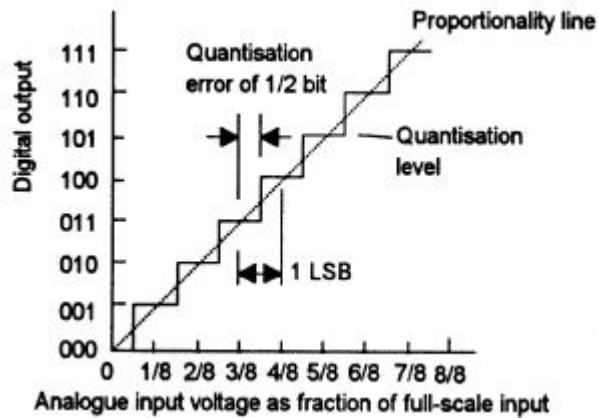


( )



ADC 3bit

3bit  $2^3 = 8$





가 (Resolution)

:

ex1) n bit 가 ADC Full-scale  $V_{FS}$  ?

$$= \frac{V_{FS}}{2^n}$$

ex2) 10bit ADC 가 10V ?

$$= \frac{10}{2^{10}} = 9.8 \text{ mV}$$

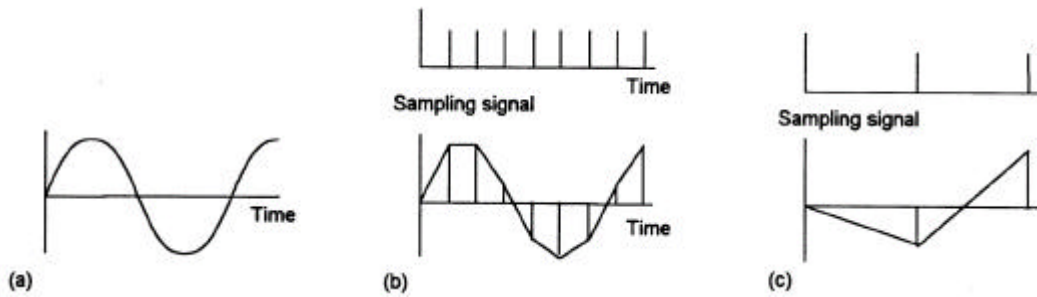
ex3) 0.5mV/ ADC . 0 200 ? 0.5

$$\text{Full scale} = \frac{200}{0.5} \times 0.5\text{mV} = 100\text{mV}$$

$$0.25 = \frac{100}{2^n} \Rightarrow n = 8.6 \Rightarrow 9\text{bit}$$

### 3.6.2 (Sampling)

가 ?



(Nyquist criterion) or (Shannon's sampling theorem)

가 2

$$f_s > 2f_{\max}$$

(sampling rate, sampling frequency) :

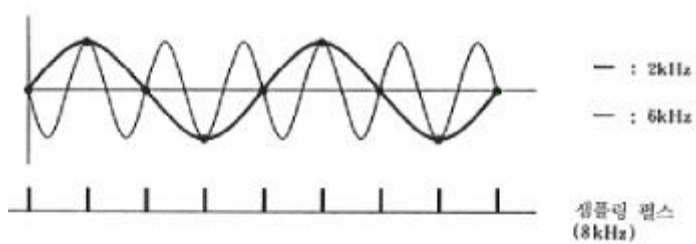
1/2

(aliasing)

2

ADC

(anti-aliasing filter)



6

8

$\frac{8}{6} f_{max}$

가  $2f_{max}$

### 3.6.3

DAC  
가

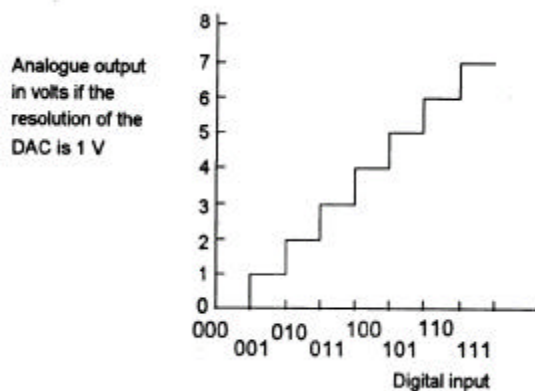
2

가

0

가 1V DAC 2 가.  
1V 가.

2

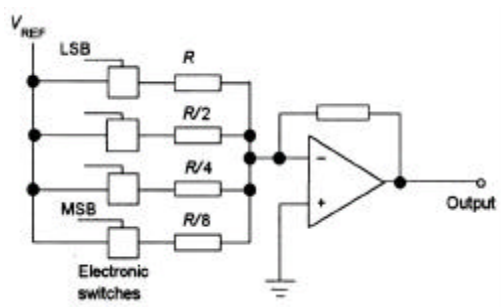


3.30 DAC

### 3.6.3

가 R-2R 가 가

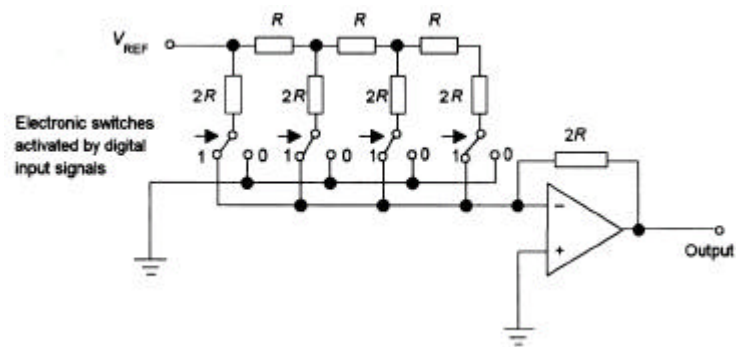
#### 1. 가



: DAC 가 가 DAC 4bit 가 가

#### 2. R-2R

0 1 가 0V

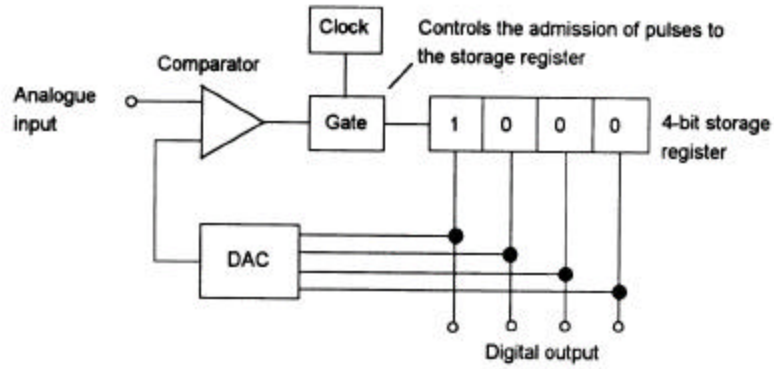


### 3.6.5

ADC

1.

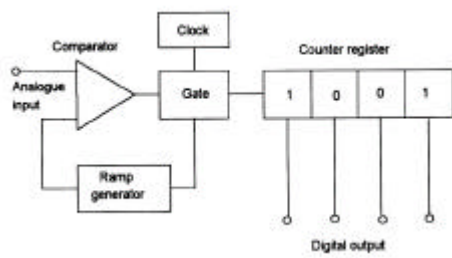
가 가 가



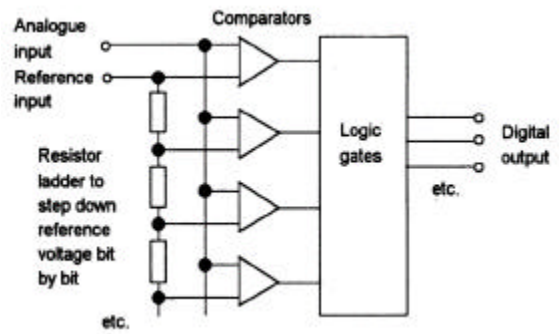
3.35 ADC

2. ADC

가 . 2 ADC가 = ADC



3.38 ADC



3.40 ADC

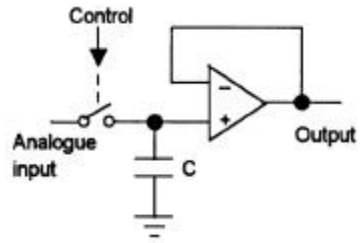
3. ADC

(comparator circuit)

. : 가 가 .  
 . : 2 가 가 가 가 .

### 3.6.6 -

ADC가



3.41 -

· **Switch On** ⇨ ⇨ = (page 64 ),

· **Switch Off** ⇨