HW#3

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Q1.

(a) condition : $s^T \cdot \theta \geq 0$, $s^T \cdot d \neq 0$

i. $s = [1\ 0]^T$, $d = [1\ 0]^T$

$s^T \cdot d = 1 \neq 0$

$$s^T \cdot e = \begin{cases} [1\ 0] \cdot [1\ 0] = 1 \geq 0 \\ [1\ 0] \cdot [0\ 1] = 0 \geq 0 \\ [1\ 0] \cdot [1\ 1] = 1 \geq 0 \end{cases}$$

ii. $s = [0\ 1]^T$, $d = [1\ 0]^T$

$s^T \cdot d = 0$

iii. $s = [1\ 1]^T$, $d = [1\ 0]^T$

$s^T \cdot d = 1 \neq 0$

$$s^T \cdot e = \begin{cases} [1\ 1] \cdot [1\ 0] = 1 \geq 0 \\ [1\ 1] \cdot [0\ 1] = 1 \geq 0 \\ [1\ 1] \cdot [1\ 1] = 2 \geq 0 \end{cases}$$

iv. $s = [1\ -1]^T$, $d = [0\ 1]^T$

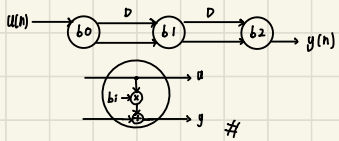
$s^T \cdot d = -1 \neq 0$

$$s^T \cdot e = \begin{cases} [1\ -1] \cdot [1\ 0] = 1 \geq 0 \\ [1\ -1] \cdot [0\ 1] = -1 < 0 \\ [1\ -1] \cdot [1\ 1] = 0 \geq 0 \end{cases}$$

⇒ "i and iii" are permissible #

(b)

i. $s = [1\ 0]^T$, $d = [1\ 0]^T$



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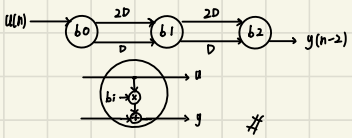
ii. $s = [1\ 1]^T$, $d = [1\ 0]^T$



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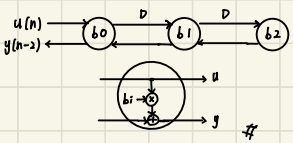
(c)

$s = [2\ -1]^T$, $d = [1\ 0]^T$, $\begin{cases} s^T e \geq 0 \\ s^T d \neq 0 \end{cases}$, $\alpha = s^T \cdot d = 2$



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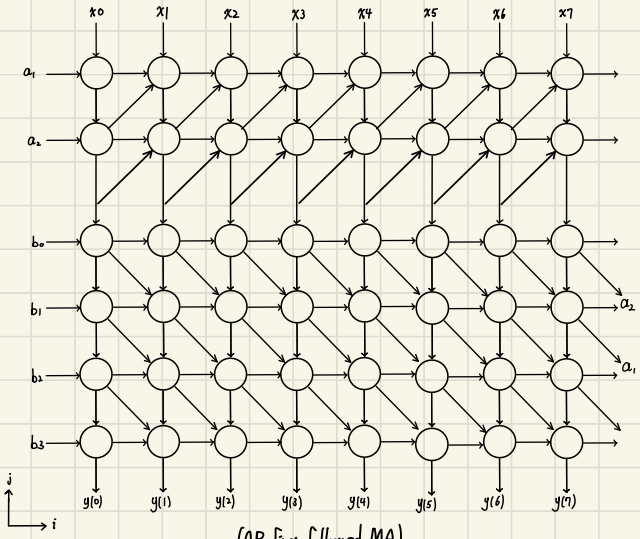
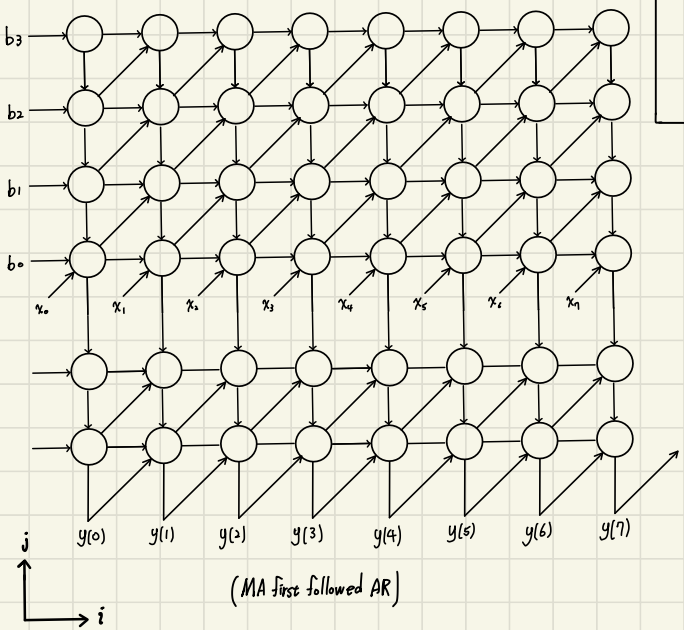
Q 2.

(a)

$$y(n) = b_0 x(n) + b_1 x(n-1) + b_2 x(n-2) + b_3 x(n-3) + a_1 y(n-1) + a_2 y(n-2)$$



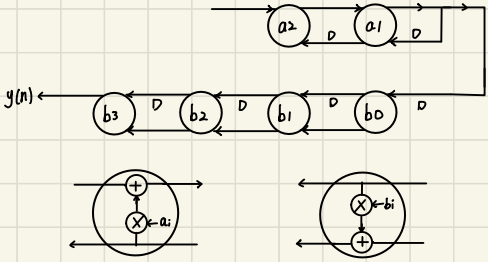
(AR first followed MA)



(MA first followed AR)

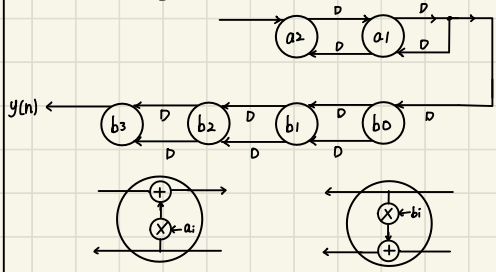
(b) Direct form

{ AR: $s=[1\ 0]^t$, $d=[1\ 0]^t$, $P=[0\ 1]$
MR: $s=[1\ 0]^t$, $d=[1\ 1]^t$, $P=[1\ -1]$



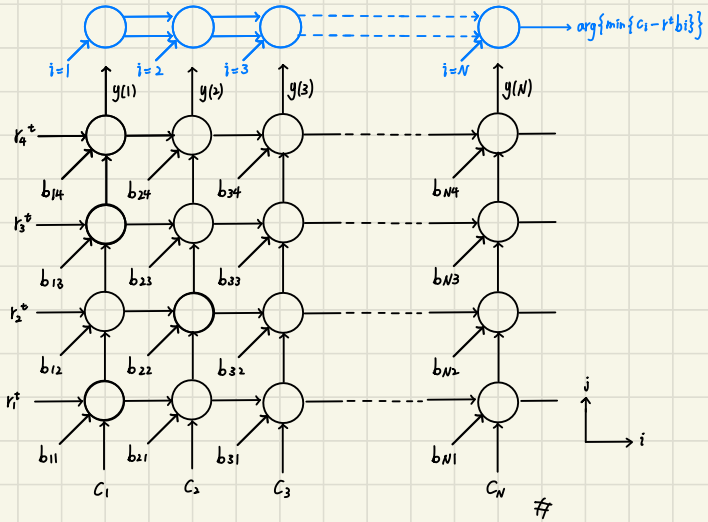
(c) Transpose form

{ AR: $s=[2\ -1]^t$, $d=[1\ 0]^t$, $P=[0\ 1]$, $\alpha=2$
MR: $s=[1\ 1]^t$, $d=[1\ 1]^t$, $P=[1\ -1]$, $\alpha=2$



Q3.

(a) $y[i] = C_i - r^k b_i$, $i = 1 \sim N$, $k = 4$



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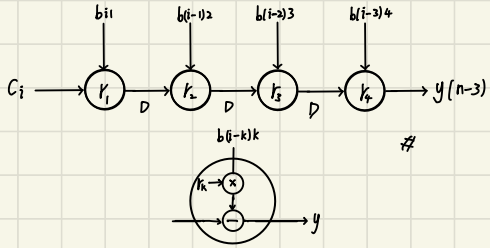
(b)

$S = [1\ 1]^T$, $d = [1\ 0^T]$



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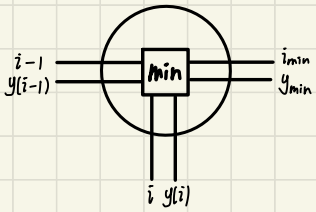
(c)

DG of comparator module is shown in (a), blue part.



Compare $y(i)$ and $y(i-1)$ and output minimum value and the index of minimum value.