Assignment I :

1:) $H(z) = \dfrac{8z^3 - 4z^2 + 11z - 2}{(z+\frac{1}{4})(z^2 - z + \frac{1}{2})}$

Denominator: $(z+1/4)(z^2-z+1/2)$

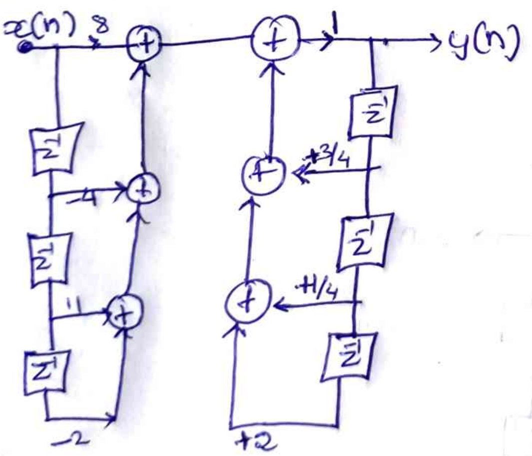
$$= z^3 - z^2 + \frac{1}{2}z + \frac{1}{4}z^2 - \frac{1}{4}z + \frac{1}{8}$$

$$= z^3 - \frac{3}{4}z^2 - \frac{1}{4}z + \frac{1}{8}.$$

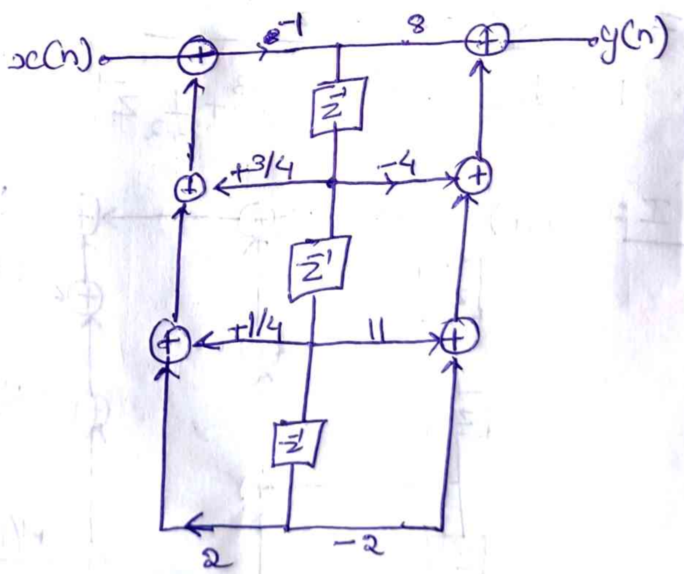
$$H(z) = \frac{8z^3 - 4z^2 + 11z - 2}{z^3 - \frac{3}{4}z^2 - \frac{1}{4}z - 2.}$$

$$= \frac{8 - 4z^{-1} + 11z^{-2} - 2z^{-3}}{1 - \frac{3}{4}z^{-1} - \frac{1}{4}z^{-2} - 2z^{-3}}$$

DIR I :



DIR II :



2.) A linear Time invariant digital IIR Filter is specified by, pg-02

$$H(z) = \frac{(z-1)(z-2)(z+1)z}{\left[z-\left(\frac{1}{2}+j\frac{1}{2}\right)\right]\left[z-\left(\frac{1}{2}-j\frac{1}{2}\right)\right]\left[z-j\frac{1}{4}\right]\left[z+j\frac{1}{4}\right]}$$

→ Numerator:

$$(z-1)(z-2)(z+1)z$$

$$(z^2-3z+2)(z+1)z$$

$$(z^3-3z^2+2z+z^2-3z+2)z$$

$$z^4-2z^3-z^2+2z$$

Denominator:

$$\left[z-\frac{1}{2}-j\frac{1}{2}\right]\left[z-\frac{1}{2}+j\frac{1}{2}\right]\left[z-j\frac{1}{4}\right]\left[z+j\frac{1}{4}\right]$$

$$= \left[z^2-\frac{1}{2}z+\cancel{j\frac{1}{2}z}-\frac{1}{2}z+\frac{1}{4}-\cancel{j\frac{1}{4}}-\cancel{\frac{1}{2}jz}+\cancel{\frac{1}{4}j}+\frac{1}{4}\right]\left[z^2+\frac{1}{16}\right]$$

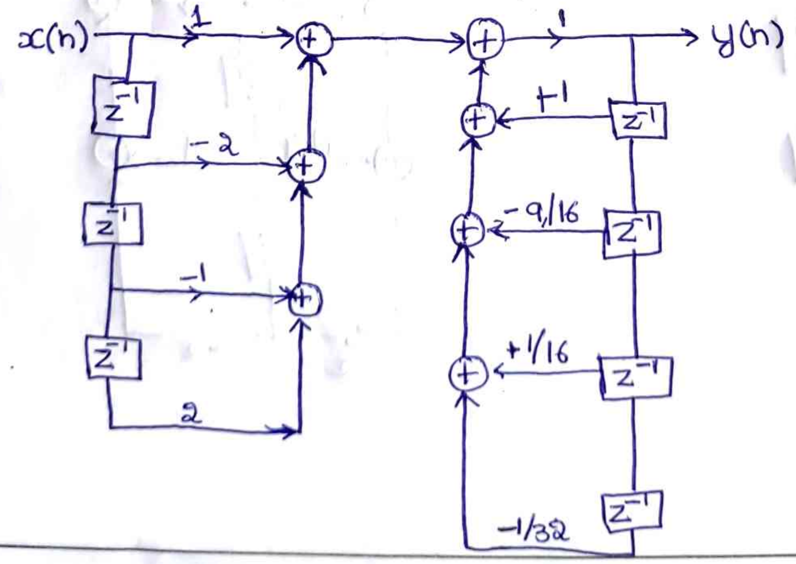
$$= \left(z^2-z+\frac{1}{2}\right)\left(z^2+\frac{1}{16}\right)$$

$$= z^4+\frac{1}{16}z^2-z^3-\frac{1}{16}z+\frac{1}{2}z^2+\frac{1}{32}$$

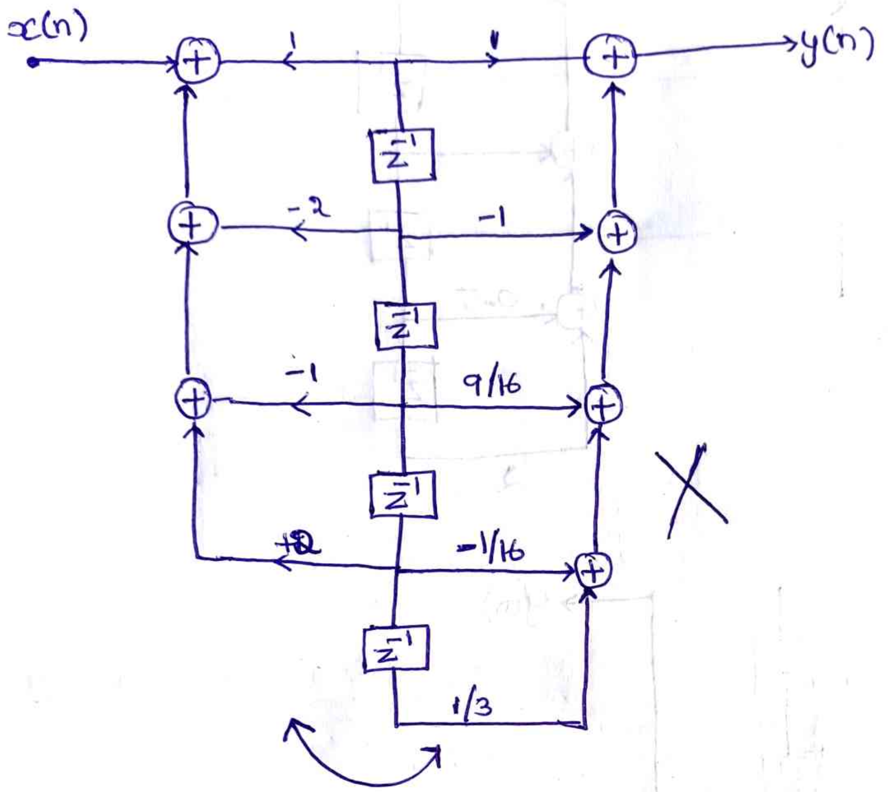
$$H(z) = \frac{z^4-2z^3-z^2+2z}{z^4+\frac{9}{16}z^2-z^3-\frac{1}{16}z+\frac{1}{32}}$$

$$= \frac{1-2z^{-1}-z^{-2}+2z^{-3}}{1+\frac{9}{16}z^{-2}-z^{-1}-\frac{1}{16}z^{-3}+\frac{1}{32}z^{-4}}$$

DIR I:



DIR II :



4.) A linear Time invariant system is designed using I/o relation as

$$2y(n) - y(n-2) - 4y(n-3) = 3x(n-2) \quad -① eq^n.$$

Realize the system in DIR I & DIR II.

→ Taking Z-transform of eq^n.(1)

$$2Y(z) - Y(z)z^{-2} - 4Y(z)z^{-3} = 3X(z)\,z^{-2}$$

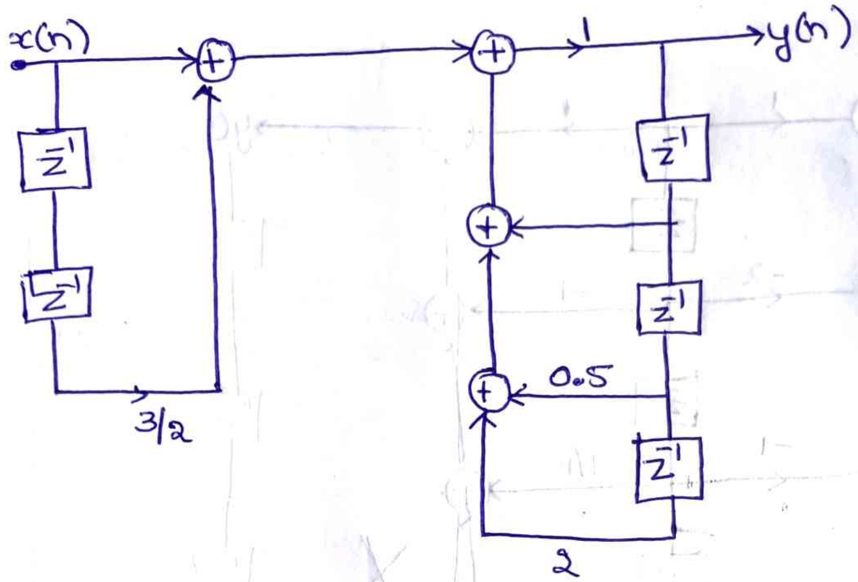
$$Y(z)\left[2 - z^{-2} - 4z^{-3}\right] = X(z)\left[3z^{-2}\right]$$

$$H(z) = \frac{Y(z)}{X(z)} = \frac{3z^{-2}}{2 - z^{-2} - 4z^{-3}}$$

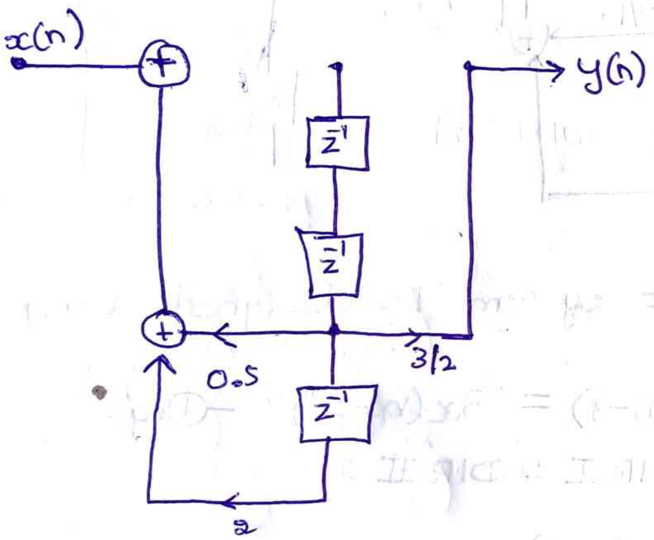
÷ N^r & Den^r by 2.

$$= \frac{\frac{3}{2}z^{-2}}{1 - 0.5z^{-2} - 2z^{-3}} \;//$$

DIR I :



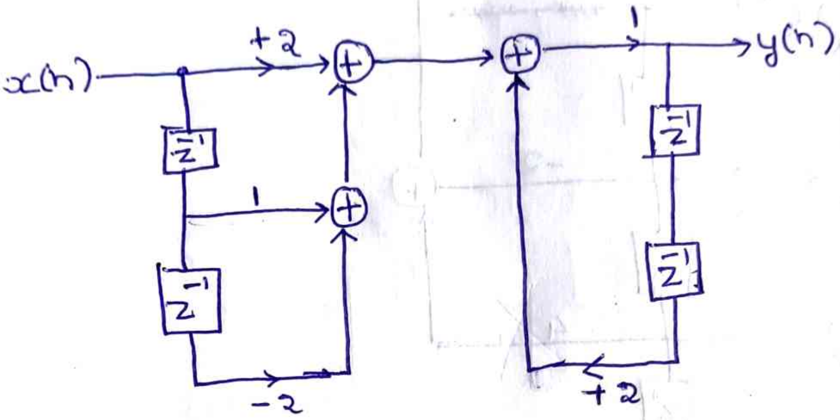
DIR II :



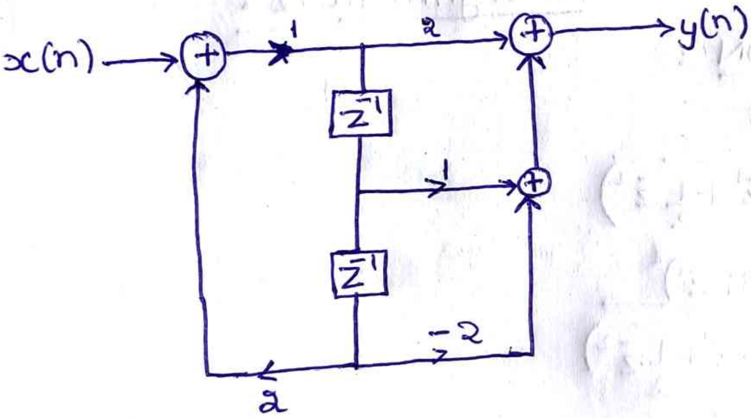
3.) $\dfrac{2z^2+z-2}{z^2-2}$

$= \dfrac{2+z^{-1}-2z^{-2}}{1-2z^{-2}}$

DIR I :

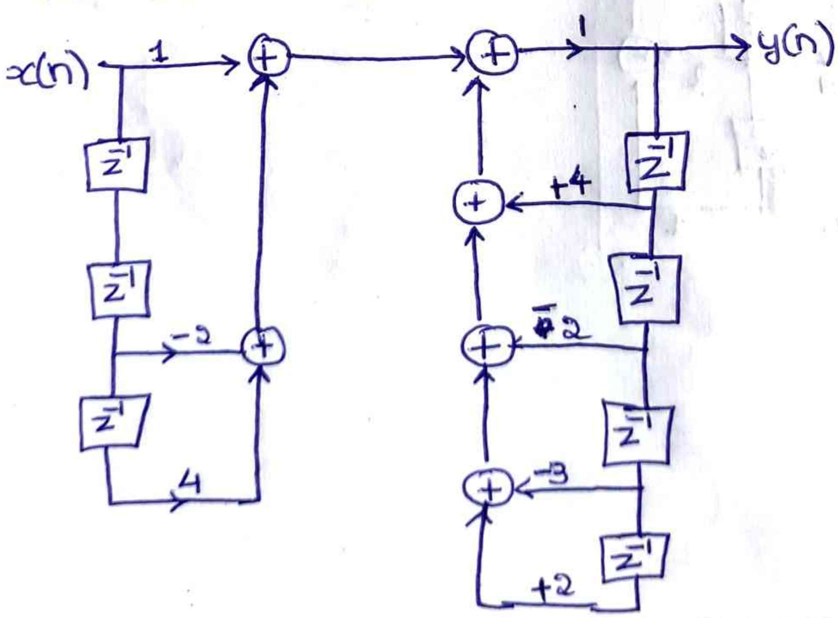


DIR II :

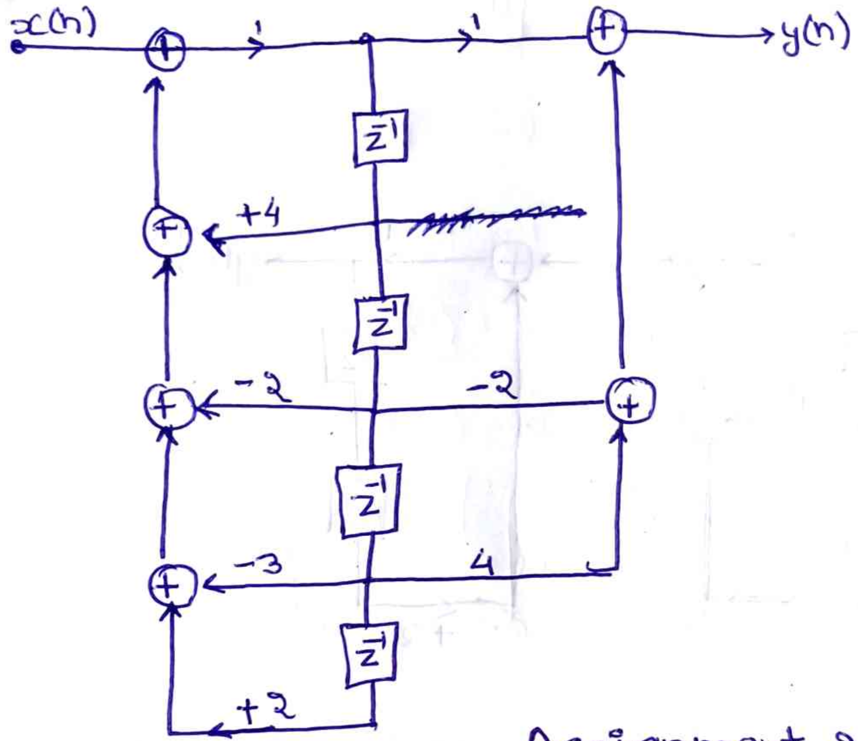


5.) $H(z) = \dfrac{1-2z^{-2}+4z^{-3}}{1-4z^{-1}+2z^{-2}+3z^{-3}-2z^{-4}}$

DIR I :



DIR II :

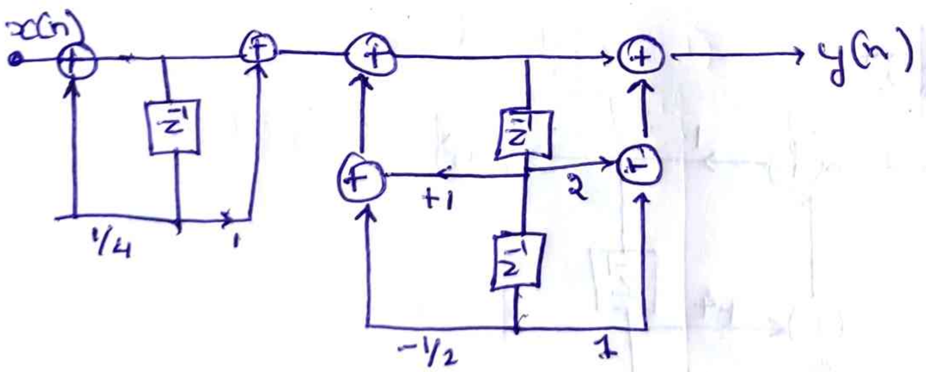


Assignment 2 :

CASCADE REALIZATION :

i) $$H(z) = \frac{(1+z^{-1})^3}{(1-\frac{1}{4}z^{-1})(1-z^{-1}+\frac{1}{2}z^{-2})}$$

$$= \underbrace{\frac{(1+z^{-1})}{(1-\frac{1}{4}z^{-1})}}_{H_1(z)} \cdot \underbrace{\frac{(1+z^{-1})^2}{(1-z^{-1}+\frac{1}{2}z^{-2})}}_{H_2(z)}$$



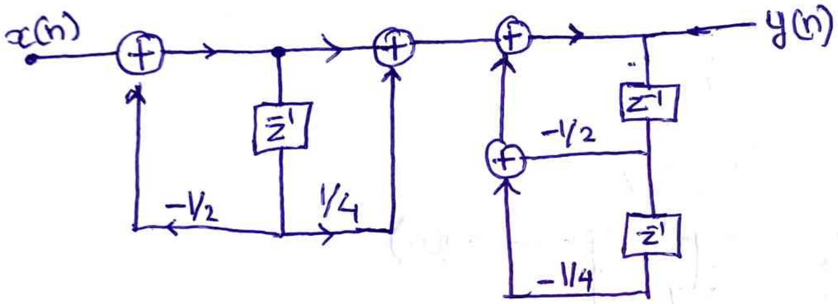
Cascade Realization:

$$H(z) = \underbrace{H_1(z) \cdot H_2(z)}_{\text{DIR form (2)}} \quad (\text{Multiplic}^n)$$

Q. 1) $$H(z) = \frac{1+\frac{1}{4}z^{-1}}{\left(1+\frac{1}{2}z^{-1}\right)\left(1+\frac{1}{2}z^{-1}+\frac{1}{4}z^{-2}\right)}$$

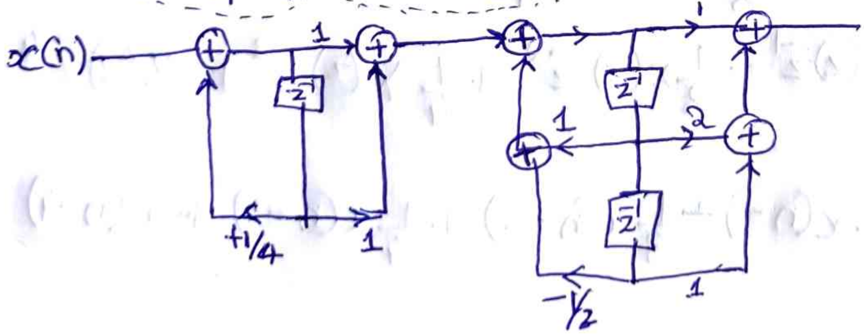
$$H_1(z) = \frac{1+\frac{1}{4}z^{-1}}{\left(1+\frac{1}{2}z^{-1}\right)\cancel{\left(1+\frac{1}{2}z^{-1}+\frac{1}{4}z^{-2}\right)}}$$

$$H_2(z) = \frac{1}{\left(1+\frac{1}{2}z^{-1}+\frac{1}{4}z^{-2}\right)}$$



Q. 2) $$H(z) = \frac{(1+z^{-1})^3}{\left(1-\frac{1}{4}z^{-1}\right)\left(1-z^{-1}+\frac{1}{2}z^{-2}\right)}$$

$$= \underbrace{\frac{(1+z^{-1})}{\left(1-\frac{1}{4}z^{-1}\right)}}_{H_1(z)} \underbrace{\frac{(1+2z^{-1}+z^{-2})}{\left(1-z^{-1}+\frac{1}{2}z^{-2}\right)}}_{H_2(z)}$$



Q: $H(z) = \dfrac{(z-1)(z-2)(z+1)z}{(z-\frac{1}{2}-j\frac{1}{2})(z-\frac{1}{2}+j\frac{1}{2})(z-\frac{1}{4}j)(z+\frac{1}{4}j)}$

Numerator:

$(z-1)(z-2)(z+1)z$

$(z^2-1)(z^2-2z)$

÷ by z^2

$(1-z^{-2})(1-2z^{-1})$

Denominator:

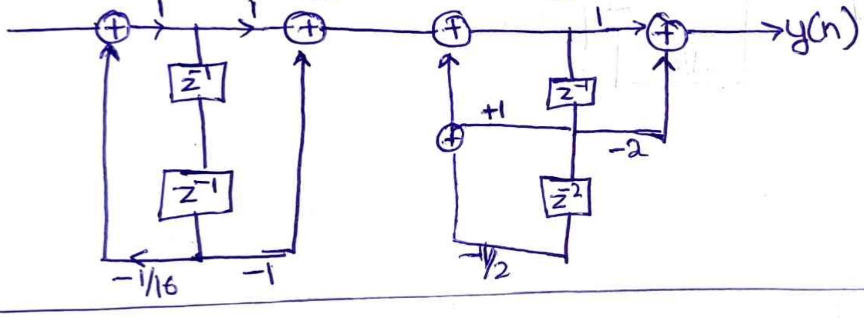
$(z^2-\frac{1}{2}z+\cancel{j\frac{1}{2}z}-\frac{1}{2}z+\frac{1}{4}-\cancel{j\frac{1}{4}}-\cancel{j\frac{1}{2}z}+\cancel{j\frac{1}{4}}-j^2\frac{1}{4})(z^2-\frac{1}{16}j^2)$

$(z^2-z+\frac{1}{2})(z^2+\frac{1}{16})$

÷ z^2.

$(1-z^{-1}+\frac{1}{2}z^{-2})(1+\frac{1}{16}z^{-2})$

$$H(z) = \frac{(1-z^{-2})(1-2z^{-1})}{(1+\frac{1}{16}z^{-2})(1-z^{-1}+\frac{1}{2}z^{-2})}$$



FIR Realiz^n:

$h(n) = \delta(n) + \frac{1}{4}\delta(n-1) - \frac{1}{8}\delta(n-2) + \frac{1}{4}\delta(n-3) + \delta(n-4)$

$H(z) = 1 + \frac{1}{4}z^{-1} - \frac{1}{8}z^{-2} + \frac{1}{4}z^{-3} + z^{-4}$

$Y(z) = X(z) + \frac{1}{4}X(z)z^{-1} - \frac{1}{8}X(z)z^{-2} + \frac{1}{4}X(z)z^{-3} + X(z)z^{-4}$

IZT

$y(n) = x(n) + \frac{1}{4}x(n-1) - \frac{1}{8}x(n-2) + \frac{1}{4}x(n-3) + x(n-4)$.

Parallel Realization:

1.4 $H(z) = \cancel{\dfrac{8z^3-4z^2+11z-2}{(1-\frac{1}{4}z^{-1})(1-z^{-1}+\frac{1}{2}z^{-2})}}$

$$H(z) = \frac{8z^3-4z^2+11z-2}{(z-\frac{1}{4})(z^2-z-\frac{1}{2})} \quad (\div z^3)$$

$$= \frac{8-4z^{-1}+11z^{-2}-2z^{-3}}{(1-\frac{1}{4}z^{-1})(1-z^{-1}+\frac{1}{2}z^{-2})}$$

By applying Partial Fractions,

$$H(z) = \frac{A}{(1-\frac{1}{4}z^{-1})} + \frac{Bz^{-1}+C}{(1-z^{-1}+\frac{1}{2}z^{-2})} + D \quad -(A*)$$

$$\frac{8-4z^{-1}+11z^{-2}-2z^{-3}}{\cancel{(1-\frac{1}{4}z^{-1})(1-z^{-1}+\frac{1}{2}z^{-2})}} = \frac{A(1-z^{-1}+\frac{1}{2}z^{-2})+(Bz^{-1}+C)(1-\frac{1}{4}z^{-1})+D(1-\frac{1}{4}z^{-1})(1-z^{-1}+\frac{1}{2}z^{-2})}{\cancel{(1-\frac{1}{4}z^{-1})(1-z^{-1}+\frac{1}{2}z^{-2})}}$$

$$8-4z^{-1}+11z^{-2}-2z^{-3} = A-Az^{-1}+\frac{1}{2}Az^{-2}+Bz^{-1}-B\frac{1}{4}z^{-2}+C-\frac{1}{4}Cz^{-1}+(D-D\frac{1}{4}z^{-1})(1-z^{-1}+\frac{1}{2}z^{-2})$$

$$8-4z^{-1}+11z^{-2}-2z^{-3} = A-Az^{-1}+\frac{1}{2}Az^{-2}+Bz^{-1}-B\frac{1}{4}z^{-2}+C-\frac{1}{4}Cz^{-1}+D-Dz^{-1}+D\frac{1}{2}z^{-2}-\frac{D}{4}z^{-1}$$
$$+D\frac{1}{4}z^{-2}+\frac{1}{8}Dz^{-3}.$$

$$8-4z^{-1}+11z^{-2}-2z^{-3} = A+C+D-z^{-1}(A-B+\frac{C}{4}+D\frac{5}{4})+z^{-2}(\frac{A}{2}-\frac{B}{4}+\frac{D3}{4})-\frac{1}{8}Dz^{-3}$$

Comparing LHS & RHS;

$$A+C+D = 8, \quad -(1)$$

$$A-B+\frac{C}{4}+D\frac{5}{4} = 4 \quad -(2)$$

$$\frac{A}{2}-\frac{B}{4}+D\frac{3}{4} = 11 \quad -(3)$$

$$-\frac{1}{8}D = -2 \Rightarrow \boxed{D=+16} \quad -(4)$$

Substitute 'D' in (1),(2) & 3.

$$A+C = -8 \quad -(1A)$$

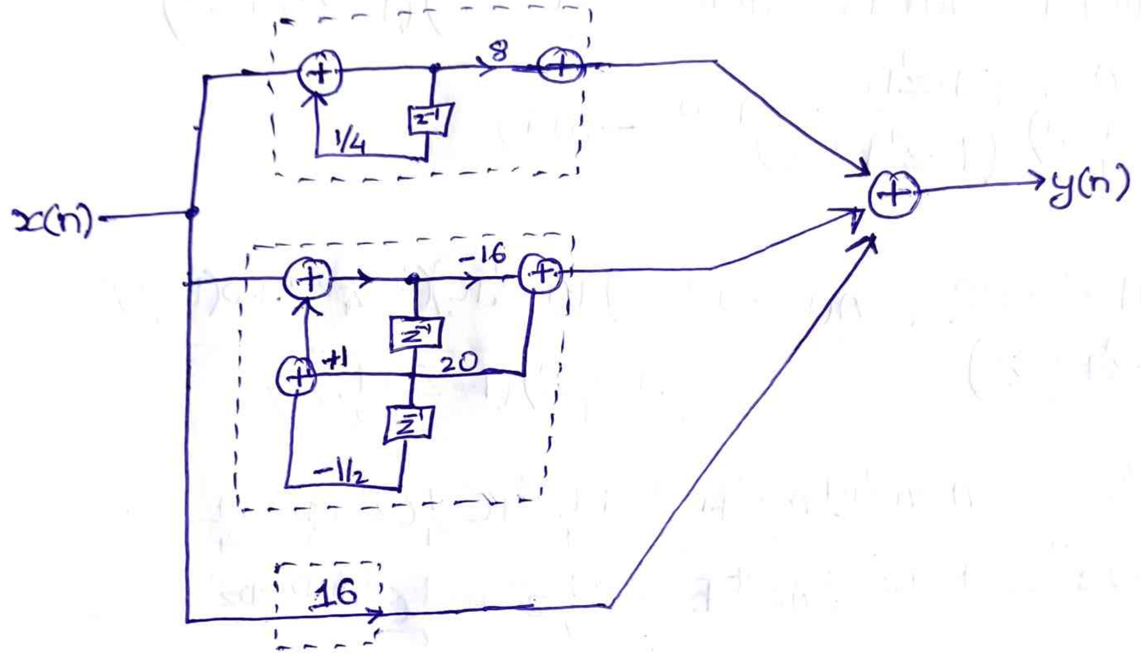
$$A-B+\frac{C}{4} = -16 \quad -(2A)$$

$$\frac{A}{2}-\frac{B}{4} = -1 \quad -(3A)$$

$$\boxed{\begin{matrix} A=8; & B=20; \\ C=-16; & D=16. \end{matrix}}$$

Substituting A, B, C & D in eqn (A*)

$$H(z)=\frac{8}{(1-\frac{1}{4}z^{-1})}+\frac{20z^{-1}-16}{(1-z^{-1}+\frac{1}{2}z^{-2})}+16$$



Q2) Obtain a parallel Realizn. of the following System funcn.

$$H(z)=\frac{1+\frac{1}{4}z^{-1}}{(1+\frac{1}{2}z^{-1})(1+\frac{1}{2}z^{-1}+\frac{1}{4}z^{-2})}$$

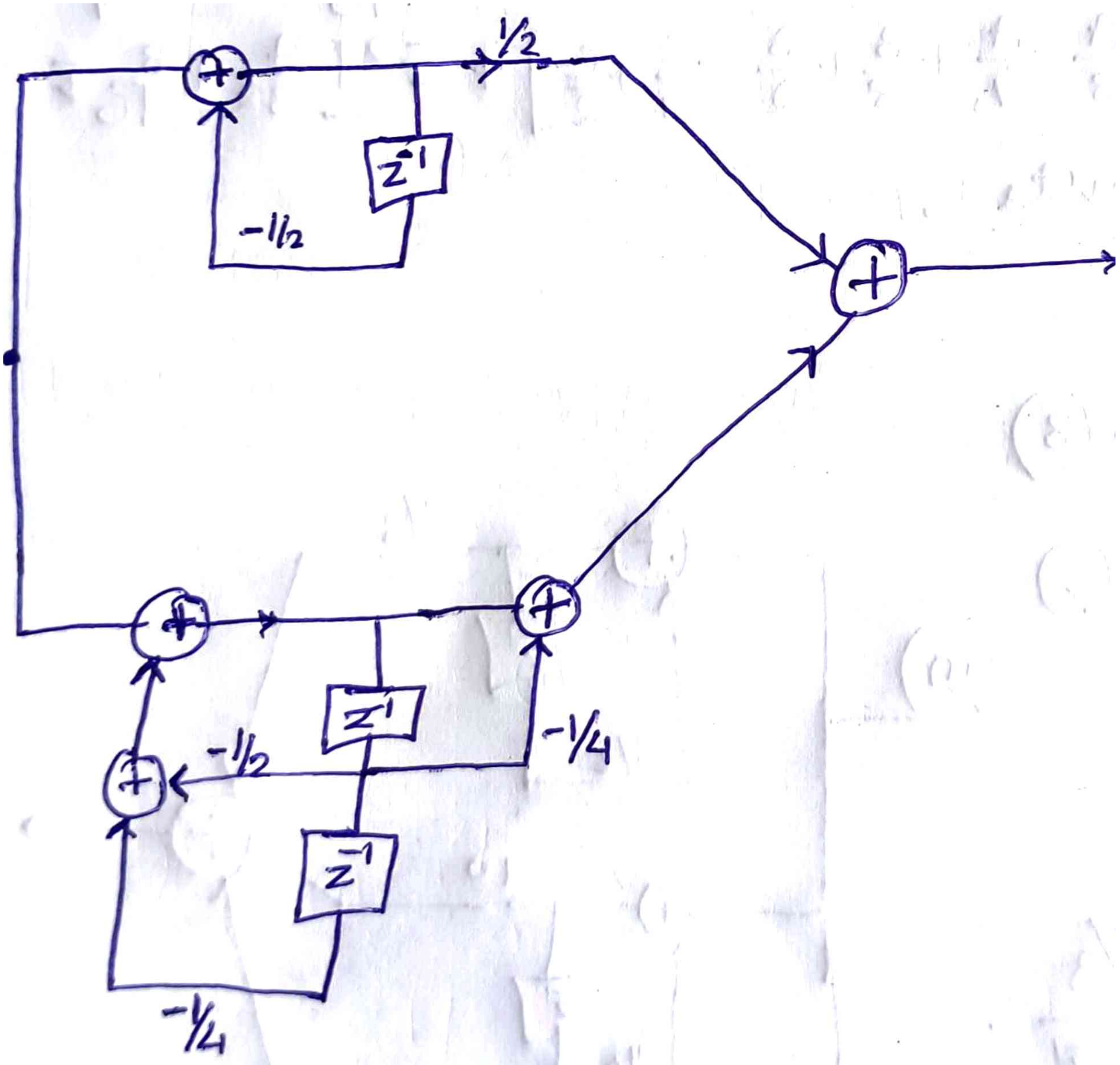
By applying Partial Fractions ;

$$H(z)=\frac{A}{(1+\frac{1}{2}z^{-1})}+\frac{Bz^{-1}+C}{(1+\frac{1}{2}z^{-1}+\frac{1}{4}z^{-2})} \quad \text{—(A) eq.}$$

$$\frac{1+\frac{1}{4}z^{-1}}{(1+\frac{1}{2}z^{-1})\cancel{(1+\frac{1}{2}z^{-1}+\frac{1}{4}z^{-2})}}=\frac{A(1+\frac{1}{2}z^{-1}+\frac{1}{4}z^{-2})+(Bz^{-1}+C)(1+\frac{1}{2}z^{-1})}{(1+\frac{1}{2}z^{-1})\cancel{(1+\frac{1}{2}z^{-1}+\frac{1}{4}z^{-2})}}$$

$$1+\frac{1}{4}z^{-1}=A+\frac{1}{2}Az^{-1}+\frac{1}{4}Az^{-2}+Bz^{-1}+\frac{B}{2}z^{-2}+C+\frac{1}{2}Cz^{-1}$$

$$1+\frac{1}{4}z^{-1}=A+C+z^{-1}\left(\frac{A}{2}+B+\frac{C}{2}\right)+z^{-2}\left(\frac{A}{4}+\frac{B}{2}\right)$$


1/2
z^{-1}
-1/2
z^{-1}
-1/4
-1/2
z^{-1}
-1/4

... fractions,

$$= \frac{A}{(1+\frac{1}{2}z^{-1})} + \frac{B}{(1-\frac{1}{4}z^{-1})} + \frac{C}{(1+\frac{1}{8}z^{-1})}$$

$$\frac{\ldots)(1+2z^{-1})}{\ldots)(1-\frac{1}{4}z^{-1})(1+\frac{1}{8}z^{-1})} = \frac{A(1-\frac{1}{4}z^{-1})(1+\frac{1}{8}z^{-1}) + B(1+\frac{1}{2}z^{-1})(1+\frac{1}{8}z^{-1}) + C(1+\frac{1}{2}\ldots}{(1+\frac{1}{2}z^{-1})(1-\frac{1}{4}z^{-1})(1+\frac{1}{8}z^{-1})}$$

$$\ldots + 2z^{-2} = (A - A\frac{1}{4}z^{-1})(1+\frac{1}{8}z^{-1}) + B(1+\frac{1}{8}z^{-1}+\frac{1}{2}z^{-1}+\frac{1}{16}z^{-2}) + C(1-\frac{1}{4}z^{-1}+\frac{1}{2}z^{-1}-\frac{1}{8}\ldots$$

$$= A + A\frac{1}{8}z^{-1} - A\frac{1}{4}z^{-1} + A\frac{1}{32}z^{-2} + B + B\frac{1}{8}z^{-1} + B\frac{1}{2}z^{-1} + B\frac{1}{16}z^{-2} + C - \frac{C}{4}z^{-1} + \frac{C}{2}z^{-1} - \frac{C}{8}\ldots$$

$$\ldots 2z^{-2} = A+B+C + z^{-1}\left[\underbrace{\frac{A}{8}-\frac{A}{4}} + \frac{B}{8} + \frac{B}{2} - \frac{C}{4} + \frac{C}{2}\right] + z^{-2}\left[\frac{A}{32} + \frac{B}{16} - \frac{C}{8}\right]$$

...ing the coefficients,

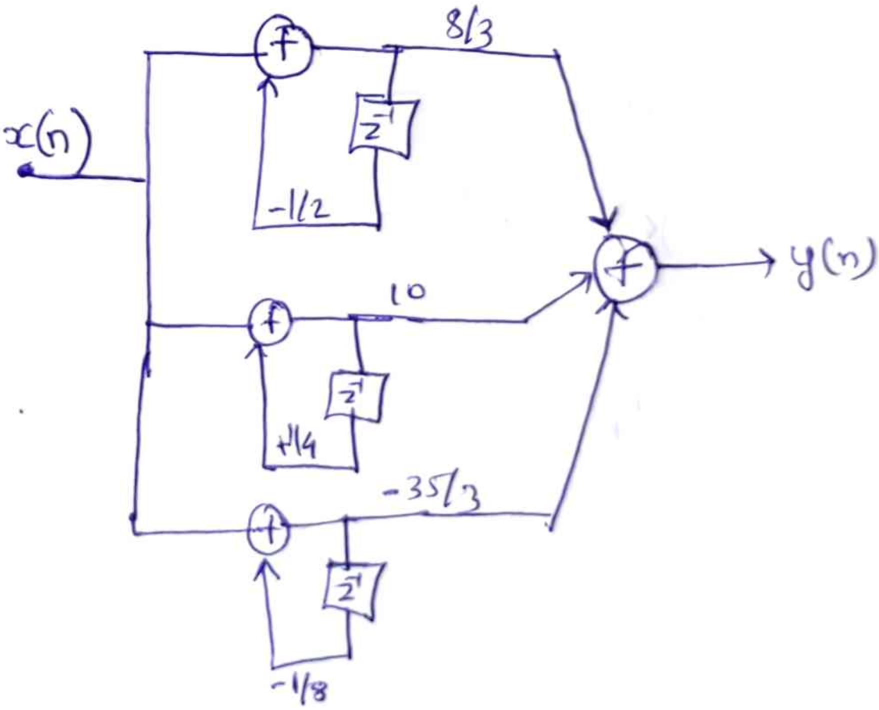
$\ldots + C = 1$ — (A)

$\ldots \frac{5}{8}B + \frac{C}{4} = 3$ — (B)

$\ldots - \frac{C}{8} = +2$ — (C)

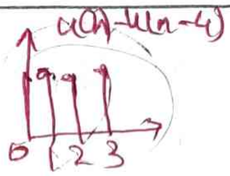
$\ldots,\ B = 10,\ C = \frac{35}{3}$

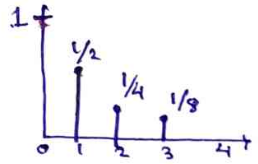
$$\ldots + \frac{10}{(1-\frac{1}{4}z^{-1})} + \frac{-35/3}{1+\frac{1}{8}z^{-1}}$$



FIR Filter Realiz^n:

1) $h(n) = \left(\frac{1}{2}\right)^n [u(n) - u(n-4)]$





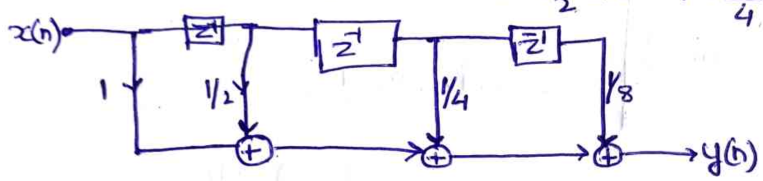
$$h(n) = \delta(n) + \frac{1}{2}\delta(n-1) + \frac{1}{4}\delta(n-2) + \frac{1}{8}\delta(n-3)$$

$$H(z) = 1 + \frac{1}{2}z^{-1} + \frac{1}{4}z^{-2} + \frac{1}{8}z^{-3}$$

$$\boxed{Y(z) = X(z) + \frac{1}{2}X(z)z^{-1} + \frac{1}{4}X(z)z^{-2} + \frac{1}{8}X(z)z^{-3}}$$

~~The lin~~ IZT,

$$y(n) = x(n) + \frac{1}{2}x(n-1) + \frac{1}{4}x(n-2) + \frac{1}{8}x(n-3)$$



2) $h(n) = \delta(n) - \frac{1}{4}\delta(n-1) + \frac{1}{2}\delta(n-2) + \frac{1}{2}\delta(n-3) - \frac{1}{4}\delta(n-4) + \delta(n-5)$

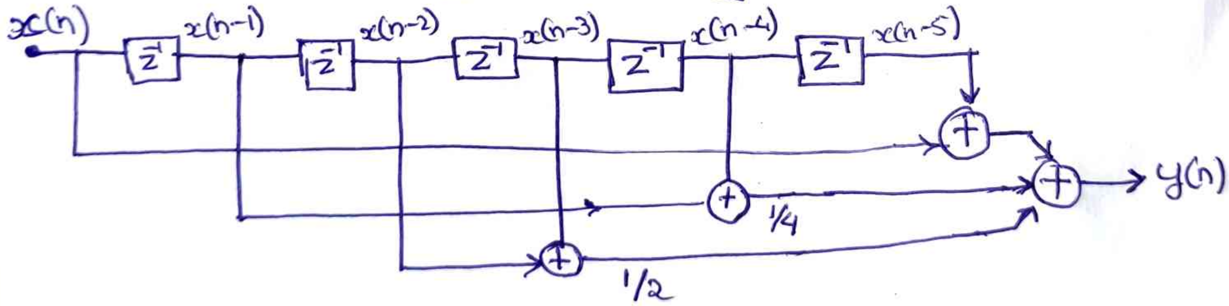
$$H(z) = \frac{Y(z)}{X(z)} = 1 - \frac{1}{4}z^{-1} + \frac{1}{2}z^{-2} + \frac{1}{2}z^{-3} - \frac{1}{4}z^{-4} + z^{-5}$$

$$Y(z) = X(z) - \frac{1}{4}X(z)z^{-1} + \frac{1}{2}X(z)z^{-2} + \frac{1}{2}X(z)z^{-3} - \frac{1}{4}X(z)z^{-4} + X(z)z^{-5}$$

ZT,

$$y(n) = x(n) - \frac{1}{4}x(n-1) + \frac{1}{2}x(n-2) + \frac{1}{2}x(n-3) - \frac{1}{4}x(n-4) + x(n-5)$$

$$y(n) = x(n) - \frac{1}{4}[x(n-1) + x(n-4)] + \frac{1}{2}[x(n-2) + x(n-3)] + x(n-5).$$



, 2^{nd} order Lattice struc.

$(z) = 1 + 2z^{-1} + \frac{1}{3}z^{-2}$

$2_{//}$ $\quad Y(z) = 1 + a_2(1)z^{-1} + a_2(2)z^{-2}$

$y(n) = 1 + a_2(1)\,x(n-1) + a_2(2)\,x(n-2)_{//}$

$$\boxed{\begin{aligned} &= a_m(m) \\ &{}_{-1}(i) = \frac{a_m(i) - a_m(m)a_m(m-i)}{1 - K_m^2} \end{aligned}}$$

$1 \le i \le m-1$.

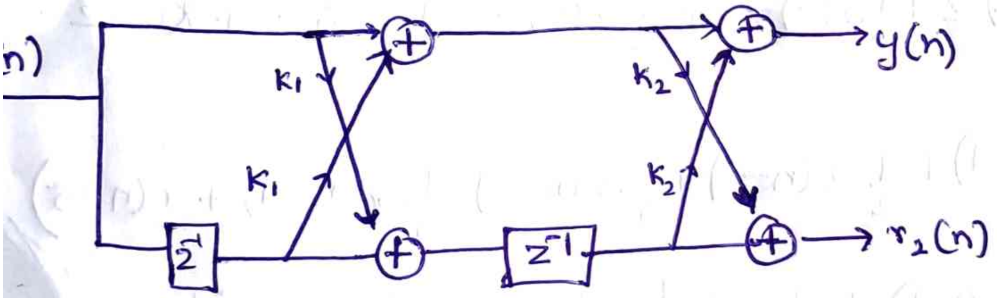
$K_2 = a_2(2) = 1/3$.

$M-1$

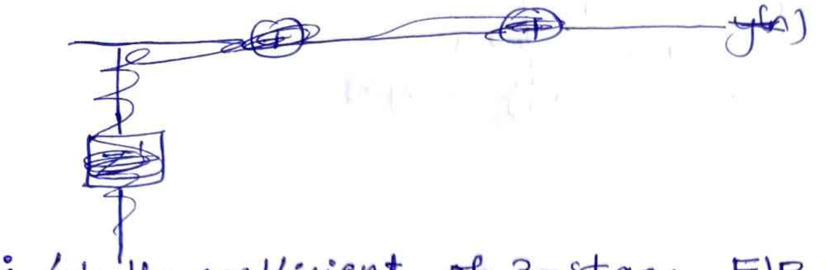
$1.$ $\quad a_1(1) = \frac{a_2(1) - a_2(2)a_2(1)}{1 - K_2^2}$

$$= \frac{2 - \frac{1}{3}(2)}{1 - \frac{1}{9}} = \frac{4/\cancel{3}}{8/9_3} = 1.5 = \underline{\underline{3/2}}$$

$K_1 = a_1(1) = \frac{3}{2}_{//}$



~~DIF-I~~ =



Q: Let the coefficient of 3-stage FIR filter be
$K_1 = 0.1,\ K_2 = 0.2,\ K_3 = 0.3$.
Find the coefficients of Direct form I FIR filter & draw its Block diagram.

→ $m = 3$.

$$\begin{array}{cccc} 1 & z^{-1} & z^{-2} & z^{-3} \\ & \downarrow & \downarrow & \downarrow \\ & a_3(1) & a_3(2) & a_3(3) \end{array}$$

m=1,	m=2	m=3
$a_1(0) = 1$	$a_2(0) = 1$	$a_3(0) = 1$
$a_1(1) = 0.1$	$a_2(1) = ?$	$a_3(1) = ?$
	$a_2(2) = 0.2$	$a_3(2) = ?$
		$a_3(3) = 0.3$

~~$a_2(1) =$~~

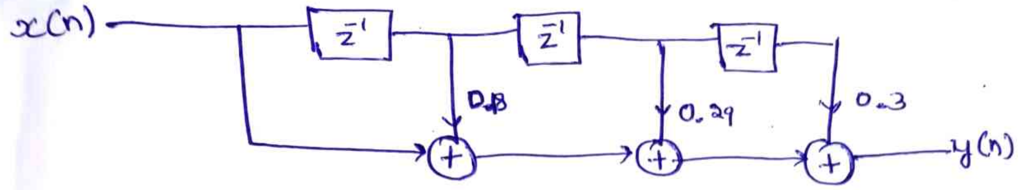
$$a_m(i) = a_{m-1}(i) + a_m(m)a_{m-1}(m-i)$$

$$a_2(1) = a_1(1) + a_2(2)\,a_1(1)$$
$$= 0.1 + (0.2)(0.1)$$

$m=3$. $$a_3(1) = a_2(1) + a_3(3)a_2(2)$$
$$= 0.3 + 0.3(0.2)$$
$$= 0.18$$

$$a_3(2) = a_2(2) + a_3(3)a_2(1)$$
$$= 0.2 + (0.3)(0.3)$$
$$= 0.29$$

$$\therefore H(z) = 1 + 0.18z^{-1} + 0.29z^{-2} + 0.3z^{-3}$$


x(n)
z^{-1}
z^{-1}
z^{-1}
0.8
0.29
0.3
y(n)

Realize the given FIR filter using lattice Realiz^n.

$y(n) = x(n) + 3.1x(n-1) + 5.5x(n-2) + 4.2x(n-3) + 2.3x(n-4)$.

$H(z) = \frac{Y(z)}{X(z)} = 1 + 3.1z^{-1} + 5.5z^{-2} + 4.2z^{-3} + 2.3z^{-4}$.

$3.1 \to a_4(1)$, $5.5 \to a_4(2)$, $4.2 \to a_4(3)$, $2.3 \to a_4(4)$

$m=4$;

$K_m = a_m(m)$

$a_{m-1}(i) = \frac{a_m(i) - a_m(m)a_m(m-i)}{1-K_m^2}$ $\quad 1 \le i \le m-1$.

$a_4(4) = 2.3$

$\boxed{K_4 = 2.3}$

$a_3(i) = a_4(i) - a_4(4)a_4(4-i)$ $\quad \{m=4\}$

$i=1, \quad a_3(1) = 1.529$

$i=2, \quad a_3(2) = 1.66$

$a_3(3) = 0.68$

$\boxed{K_3 = 0.68}$

$a_2(i) = \frac{a_3(i) - a_3(3)a_3(3-i)}{1-K_3^2}$ $\quad \{m=3\}$

$1 \le i \le 2$

$a_2(1) = 0.74$

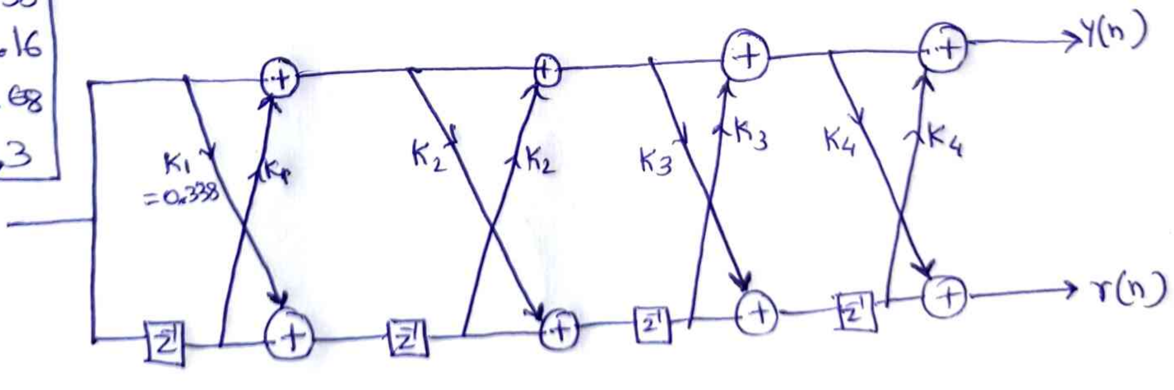
$a_2(2) = 1.154$

$\boxed{K_2 = 1.154}$

$a_1(1) = \frac{a_2(1) - a_2(2)a_2(2-1)}{1-K_2^2}$ $\quad \{m=2\}$

$a_1(1) = \boxed{0.343 = K_1}$

$\therefore$ $\boxed{\begin{array}{l} K_1 = 0.338 \\ K_2 = 1.16 \\ K_3 = 0.68 \\ K_4 = 2.3 \end{array}}$



A linear T. inv. Sysm. is defined by ~~H(z)~~ =

$$H(z) = \frac{0.129 + 0.3867 z^{-1} + 0.3869 z^{-2} + 0.129 z^{-3}}{1 - 0.2971 z^{-1} + 0.387 z^{-2} - 0.0276 z^{-3}}$$

Denm^r = B(z) = ↗

Numer^r = A(z) — ↘

Step 1:

$B(z) = 0.129 + 0.3867 z^{-1} + 0.3869 z^{-2} + 0.129 z^{-3}$.

$m = 3$.

$$\beta_i = B_i - \sum_{m=i+1}^{M} \beta_m a_m(m-i)$$

$\beta_3 = b_3 = 0.129$

$$\beta_2 = b_2 - \sum_{m=3}^{3} \beta_m a_m(m-2)$$

$$\beta_1 = b_1 - \sum_{m=2}^{3} \beta_m a_m(m-1)$$

$\beta_0 = b_0 - \beta_1 a_1(1)$

$A(z) = \cancel{0.129 + 0.3}\ 1 - \underbrace{0.2971}_{a_3(1)} z^{-1} + \underbrace{0.3567}_{a_3(2)} z^{-2} - \underbrace{0.0276}_{a_3(3)} z^{-3}$

$K_m = a_m(m)$

$\boxed{K_3 = a_3(3) = 0.0276}$

$$a_{m-1}(i) = \frac{a_m(i) - a_m(m) a_m(m-i)}{1 - K_m^2}$$

$$a_2(i) = \frac{a_3(i) - a_3(3) a_3(3-i)}{1 - K_3^2}, \quad 1 \le i \le \frac{m-1}{2},$$

$a_2(1) = -0.3077$

$a_2(2) = 0.3485$

$m = 2, \ 1 \le i \le 1.$

$a_1(1) = a_2(1)$

$= -0.228$

$\boxed{K_1 = -0.2132}$

$K_1 = -0.2132$, $K_2 = 0.3485$, $K_3 = -0.276$.

Forward tap coefficients:

$$\beta_i = b_i - \sum_{m=i+1}^{M} \beta_m a_m(m-i)$$

$$\beta_3 = b_3 = 0.129$$

$$\beta_2 = b_2 - \sum_{m=3}^{3} \beta_3 a_3(3-2)$$

$$= b_2 - \beta_3 a_3(1)$$

$$B(z) = 0.129 + 0.3867 z^{-1} + 0.3869 z^{-2} + 0.129 z^{-1}$$

$\downarrow b_0$ $\downarrow b_1$ $\downarrow b_2$ $\downarrow b_3$

$$= 0.3869 - (0.129)(-0.2971)$$

$$= 0.4252$$

$$\beta_1 = b_1 - \sum_{2}^{3} \beta_3 a_3(3-1)$$

$$= b_1 - \beta_2 a_2(1) - \beta_3 a_3(2)$$

$$= 0.3867) - (0.4252 \times -0.287) -$$

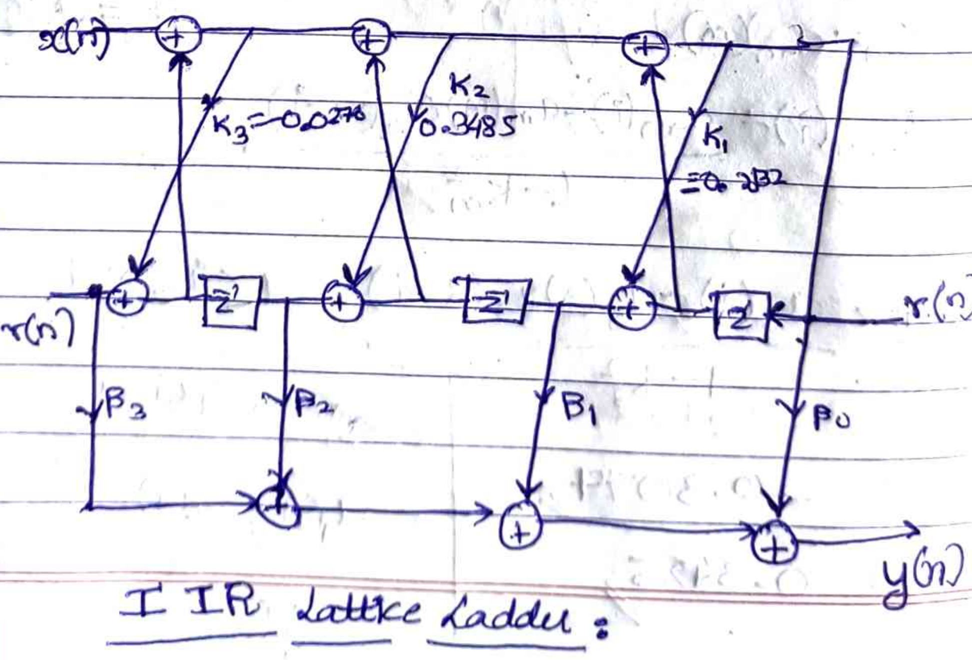
$$= 0.462$$

$$\beta_0 = b_0 - \sum_{m=0+1}^{3} \beta_m a_m(m-i) \quad \approx 30$$

$$= 0.129 - \beta_1 a_1(1) - \beta_2 a_2(2) - \beta_3 a_3(3)$$

$$= 0.0828 \approx 0.0831$$

$$\boxed{\begin{aligned} \beta_0 &= 0.0831 \\ \beta_1 &= 0.463 \\ \beta_2 &= 0.4252 \\ \beta_3 &= 0.129 \end{aligned}}$$



IIR Lattice Ladder:

king ZT on both sides,

$$\frac{Y(z)}{X(z)} = \frac{1+2z^{-1}}{1+\frac{3}{4}z^{-1}+\frac{1}{4}z^{-2}}$$

$B(z) \rightarrow b_0 = 1,\ b_1 = 2.$

$A(z)$

$\frac{3}{4} \downarrow a_2(1)$ $\quad \frac{1}{4} \downarrow a_2(2)$

2

$K_m = a_m(m).$

$)=$ $\boxed{K_2 = 1/4}$

$=$

$$a_{m-1}(i) = \frac{a_m(i) - a_m(m)\,a_m(m-i)}{1-K_m^2}.$$

$$a_1(1) = \frac{a_2(1) - a_2(2)\,a_2(1)}{1-K_2^2} =$$

$$\boxed{a_1(1) = 0.6 = K_1}$$

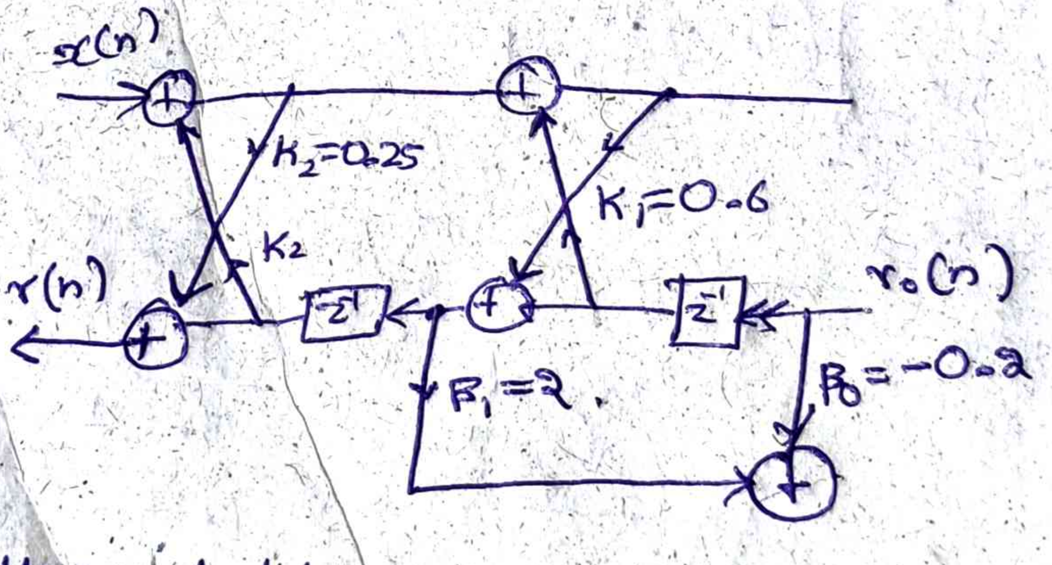
$b_i - \sum_{m=i+1}^{M} \beta_m a_m(m-i).$

$1 = 2$

$b_0 - \sum_{1}^{1} \beta_1 a_1(1)$

$1 - 1.2$

$\cdot 0.2$



Lattice Ladder Structure: IIR filt