

VVI Short ch. but 15 marks is carried surely

Chapter: 4 Discrete Filter Structure

A Structure

- ↳ The algorithm for implementing the system are better represented in terms of structure which consists of interconnection of multiplier, adder & delay elements.

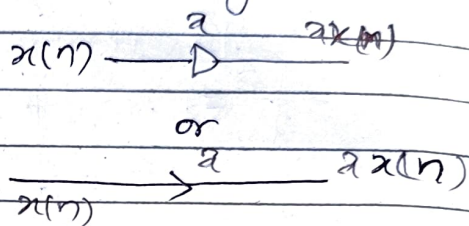
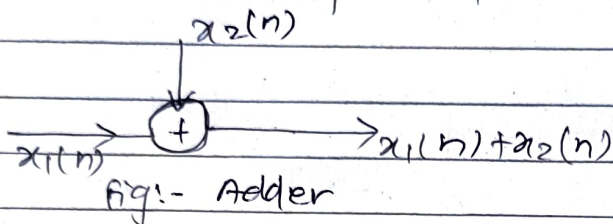
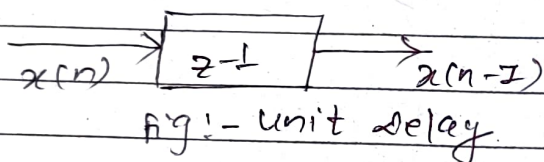


Fig:- Multiplier



{ If we want more no. of unit delay other than 1, we cascade that much no. of delay component }

- ② Difference between finite impulse response (FIR) and infinite impulse response (IIR)

FIR (FIR filters)

IIR (IIR filters)

- | | |
|--|---|
| ① In FIR, the impulse response sequence is of finite duration. This means the impulse response of FIR filters has finite number of non zero terms. | ① If infinite number of sample points are used to determine the unit sample response, these filters are known to be IIR filters |
| ② Depends only upon the present and past input samples. | ② Present response is a function of present & past values of excitation as well as past values of responses. |

③ Generally implemented using structure with no feedback.

④ Due to non recursive structure, easy to realise.

⑤ Characterized by,

$$H(z) = \sum_{k=0}^{N-1} b_k z^{-k}$$

⑥ Realization technique of FIR FILTERS are cascade, parallel, direct form structure, etc.

(i.e. you filter implement hard, you different ways how use gamma sakinix)

③ Implemented using structure having feedback.

④ Due to recursive structure, it is difficult to realize.

⑤ Characterized by,

$$H(z) = \sum_{k=0}^{\infty} b_k z^{-k}$$
$$1 + \sum_{k=1}^N a_k z^{-k}$$

⑥ Realization techniques of IIR filters are direct form, lattice, lattice ladder, etc.

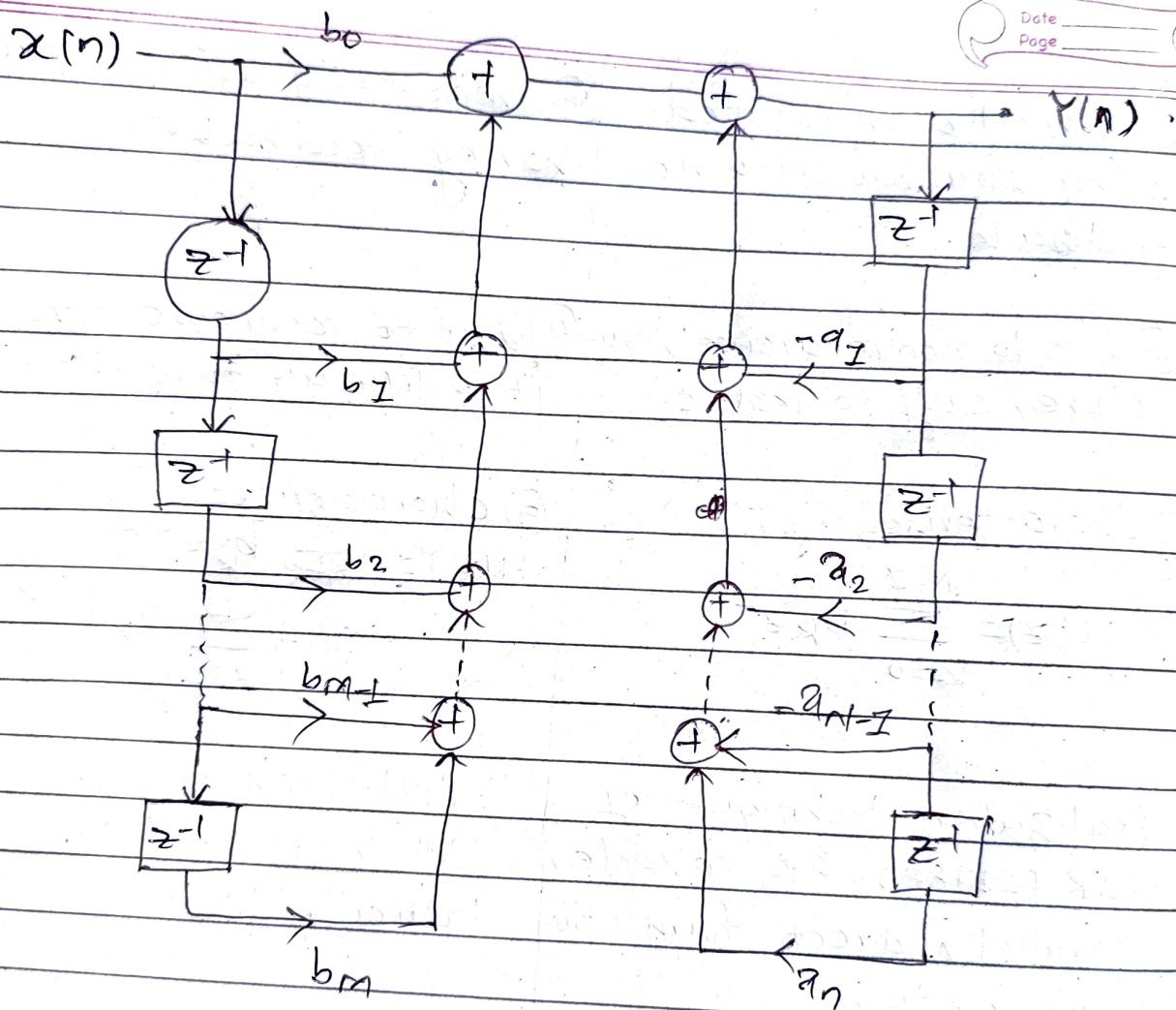
⑦ Structure of IIR system

$$H(z) = \frac{\sum_{k=0}^M b_k z^{-k}}{1 + \sum_{k=1}^N a_k z^{-k}}$$

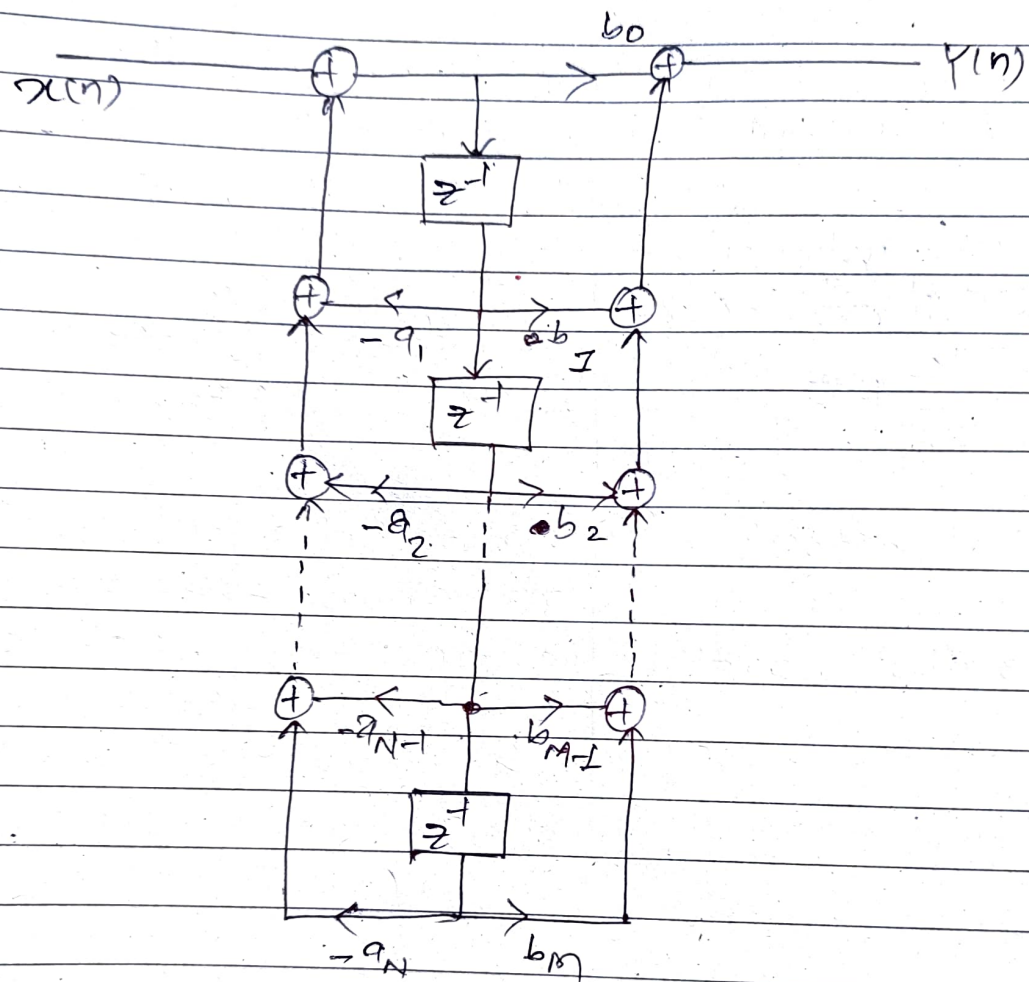
\Rightarrow General form of IIR

① Direct form structure

① Direct form I



⑥ Direct form structure II (Canonical Structure)



Q7) Which structure is best, direct form (I) or direct form (II)?

↳ Direct form (II) is best since less no. of delay elements means fast computation and in efficient manner at low cost.