

23 DAC [Digital to Analog Converter]:

Specifications:

* Used in servo controlled system.
↳ To precise the position

1. Resolution
2. Linearity
3. Accuracy
4. Settling time
5. Temperature sensitivity
6. Monotonicity
7. Conversion time
8. Stability

1) Resolution:

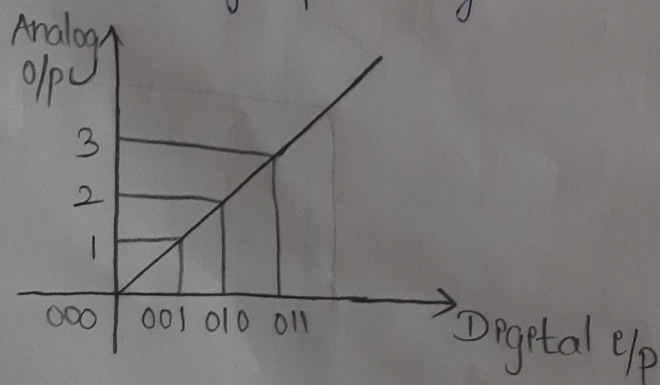
* This is the smallest possible change in the output voltage ~~that~~ DAC can produce as a percentage of full scale output range.

Eg: 8 bit DAC that generates max o/p voltage 5V.

$$\text{Resolution} \left(\frac{5V}{2^8} \right) = 19.5 \text{ mV.}$$

2) Linearity:

* Equal increment of the digital input should result in equal increment in the analog o/p voltage.



3) Accuracy:

- * The accuracy of the D/A converter is the measure of the diff. b/w the actual output voltage & the expected o/p voltage.
- * It is specified as a percentage of full scale (or) maximum o/p voltage.

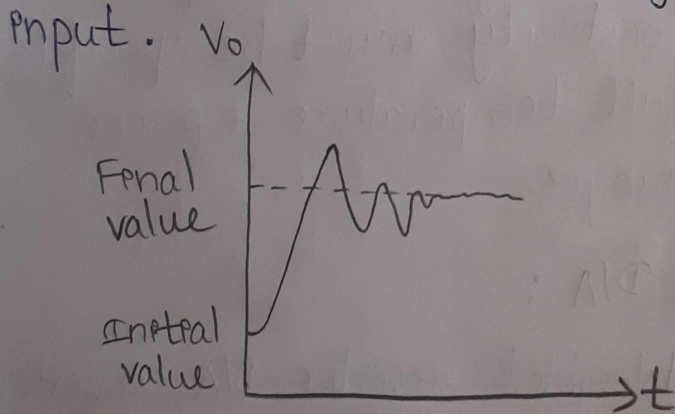
Eg: D/A converter has full scale range 10V.

$$\text{Accuracy} = \pm 0.2\%$$

$$\begin{aligned}\text{Max o/p voltage} &= 0.002 \times 10\text{V} \\ &= 20\text{mV}.\end{aligned}$$

4) Settling time:

- * The time required for the analog output to settle within $(\pm \frac{1}{2} \text{LSB})$ of the final value after the change in the digital input.
 Least significant bit



Eg: 0110
MSB LSB

5) Temperature sensitivity:

- * The analog o/p voltage for any fixed digital inputs varies with temperature. This is due to the temperature sensitivities of reference voltage source [resistors & op-Amp].

6) Monotonicity:

* A converter is said to have good monotonicity if it does not miss any step backward when stepped through its entire range.

7) Conversion time:

* It is the time required for the conversion of analog signal into its digital equivalent.

8) Stability:

* Performance of a converter changes with temperature, ageing of components and power supply variation. So, all the parameters such as gain, linearity and monotonicity must be specified over a full temperature & power supply ranges.

Types of D/A :

- 1) Weighted resistor D/A converter
- 2) R-2R ladder D/A converter

9/10/2023 1) Weighted resistor D/A converter:

