

Medium

Deputy Executive Engineer (Electrician) 2026

Gujarat Public Service Commission / Assistant Engineer (Electrical)

Consider the following statements regarding ADC characteristics: 1. Resolution of an ADC is defined as the smallest change in analog input that can be

A

1 and 2 only

B

2 only

Correct

C

1 and 3 only

D

1, 2 and 3

Correct Answer: B

Full Detailed Explanation

Correct Answer: B - 2 only

Quick Concept Explanation An ADC discretizes both amplitude and time. Bit depth controls amplitude resolution; sampling frequency controls temporal/spectral

resolution and aliasing. Key relation: $LSB = V_{FS}/2^n$ (or $V_{FS}/(2^n - 1)$, depending convention);

ideal quantization error $\leq 0.5 \text{ LSB}$; sampling theorem requires $f_s \geq 2f_{max}$ for ideal

band-limited reconstruction. Exam focus: Bits → amplitude resolution. Sampling rate

aliasing/reconstruction. Common trap: Saying "more bits means resolution is $1/n$ "; it is

approximately one part in 2^n . Statement-wise Verification

Statement 1 - Incorrect. Resolution of an ADC is defined as the smallest change in analog input that can be detected and is inversely

proportional to number of bits. As worded: the smallest quantization step decreases exponentially

with bit count, approximately as $1/2^n$, not as $1/n$. The definition part is reasonable, but the

stated proportionality makes the full statement false. Statement 2 - Correct. Quantization error

is inherent in ADC and cannot be completely eliminated but can be minimized by increasing

resolution. Finite quantization creates unavoidable quantization error; more bits reduce LSB size

and therefore reduce ideal quantization uncertainty. Statement 3 - Incorrect. Sampling rate has no

effect on signal reconstruction quality in digital systems. Sampling rate determines whether