

Assignment 4

MCQ:

1. The bit rate of a signal generated from an 8-bit generator is 3200 bps. Calculate the Baud rate of the signal.

- A. 400 Baud/sec
- B. 25600 Baud/sec
- C. 200 Baud/sec
- D. None of the above

Solution: Option A. 400 Baud/sec

Explanation: Using the relation, bit rate = no. of bits per signal unit * Baud rate; bit rate = 3200; no. of bits per signal unit = 8. Therefore, the Baud rate = $3200/8 = 400$ Baud/sec.

2. I am building a device that takes in digital signals but restricts the input higher than a certain frequency limit. What kind of filter should I use on the device?

- A. High pass filter
- B. Low pass filter
- C. Both A and B
- D. None of the above

Solution: Option A. High pass filter

Explanation: High pass filters allow the passage of signals above a set frequency.

3. An operational amplifier has

- A. Very low input impedance and infinite output impedance
- B. Infinite input impedance and infinite output impedance
- C. Infinite input impedance and very low output impedance
- D. Very low input impedance and very low output impedance

Solution: Option C. Infinite input impedance and very low output impedance

Explanation: This is a property of operational amplifiers which makes them voltage-gain devices.

4. The number of comparators needed in a flash A/D convertor for a 3-bit conversion is

- A. 3
- B. 7
- C. 8
- D. 31

Solution: Option B. 7

Explanation: The number of comparators needed for a flash A/D converter for n-bit conversion is $2^n - 1$. For n=3, the number of comparators is $8-1=7$.

5. Calculate the resolution(in mV) for a 4-bit A/D convertor over a voltage range of 15V.

- A. 0.001
- B. 1000
- C. 0.1
- D. None of the above

Solution: Option B. 1000

Explanation: $\text{Res}(Q)$ for n -bit convertor $= V/(2^n - 1)$.

Putting $n=4$, $V=15$, $\text{Res}(Q) = 15/((2^4 - 1)) = 1V = 1000\text{mV}$

6. The frequency of a circuit is f . In order to reconstruct the original signal, the incoming signal should be

- A. $=f$
- B. $<f/2$
- C. $>f/2$
- D. $=f/2$

Solution: Option B. $<f/2$

Explanation: This can be observed from the Nyquist theorem.

7. Why is the power consumption of a CMOS sensor more than a CCD sensor?

- A. CMOS sensors have embedded logic in them.
- B. CCD sensors have a higher number of DSPs.
- C. Both A and B
- D. None of the above

Solution: Option A. CMOS sensors have embedded logic in them.

Explanation: We can put logic on the chip in CMOS sensors which increases the power consumption of the system. On the other hand, CCD sensors do not have logic embedded in them.

8. Which of the following properties of the Nyquist criteria are true?

- A. Sampling frequency must be at least twice that of the highest frequency in the signal
- B. Frequency spectrum gets divided into an infinite number of Nyquist zones each having a width of half the sampling frequency.
- C. Both A and B
- D. None of the above

Solution: Option C. Both A and B

Explanation: Option A is the definition of Nyquist criteria. Option B says about the Nyquist bandwidth which is equal to half the sampling frequency.

9. How does delta-sigma modulation take place in A/D convertors?

- A. Iteratively
- B. Recursively
- C. Both A and B can be implemented.
- D. None of the above

Solution: Option A. Iteratively

Explanation: Fact. Also, recursive implementation is avoided in hardware implementations.

10. Quantization is irreversible.

- A. True
- B. False

Solution: Option A. True