

Department of Avionics,  
 Indian Institute of Space Science & Technology, Trivandrum  
**AV491 – Advanced Sensors and Interface Electronics**  
 Instructor: Anoop C. S.  
 Tutorial – 1

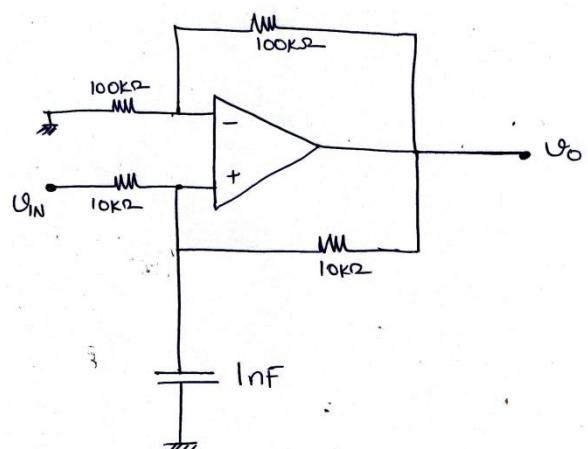
**Questions on ADC:**

- Q. 1. Compute the maximum possible SNR of an 8 bit  $\pm 5$  V ADC when its input  $V_{in}$  is: (a)  $v_{in} = 5 \sin(200\pi t)$ , (b)  $v_{in} = 2.5 \sin(200\pi t)$ .
- Q. 2. Compute the maximum SNR when a  $\pm 5$  V triangular wave is applied to a 8 bit  $\pm 5$  V ADC. What is the maximum quantization error and resolution of this ADC?
- Q. 3. Draw the schematic and timing diagram of a 10-bit Dual slope ADC.
- Q. 4. Assume that clock frequency is 1 MHz. What should be integration time so that output digital range of 10-bit Dual slope ADC is maximum? What would be maximum conversion time in this case?  
 Is the output of the ADC (in Q. 4.) independent from 50 Hz power interference present at its input?
- Q. 5. Find the voltage at important nodes of a 3-bit Sigma-Delta ADC (reference voltage = 1 V and – 1 V) when exposed to an input of 0.25 V. Check the working of this ADC for this input.

**Questions on Analog Signal Processing:**

- Q. 6. Design a Band pass filter with center frequency of 2 kHz and bandwidth of 5 Hz using UAF approach. Plot the gain vs. frequency characteristics of the filter.
- Q. 7. Design a notch filter with following specifications using universal active filter approach.  
*Filter specifications: Center-frequency of 500 Hz, Bandwidth of 10 Hz, Absolute value of Pass-band gain = 1.* Show relevant calculations. Draw the circuit of the designed filter.
- Q. 8. (a) Draw and design a GIC circuit which can simulate an inductance of 0.5 H. Use a capacitance of 10 nF and equal-valued resistors in the circuit. (b) Use the above GIC to realize a band-pass filter of center frequency 5 kHz and  $Q = 25$ . Draw the complete circuit.

- Q. 9. Design a switched-capacitor circuit which performs the same function as the circuit on right. Use a clock frequency of 1 MHz and suitable capacitors for designing the switched capacitor circuit. Support your answers with required explanations.



**Q. 10.** Study the datasheet of the IC LF398. Identify its function, modes of operation, and understand and describe its different specifications.

**Q. 11.** Find the equivalent impedance ( $Z_{eq}$ ) of following circuits and identify their use.

