

Code : 041606**(2)****B.Tech 6th Semester Exam., 2018****INTELLIGENT INSTRUMENTATION****Time : 3 hours****Full Marks : 70.****Instructions :**

- (i) The marks are indicated in the right-hand margin.
- (ii) There are **NINE** questions in this paper.
- (iii) Attempt **FIVE** questions in all.
- (iv) **Question No. 1** is compulsory.

1. Choose the correct option/Answer the following (any seven) : $2 \times 7 = 14$

(a) The number of comparators needed in a parallel conversion type 8-bit A/D converter is

- (i) 8
- (ii) 16
- (iii) 255
- (iv) 256

8AK/383**(Turn Over)**

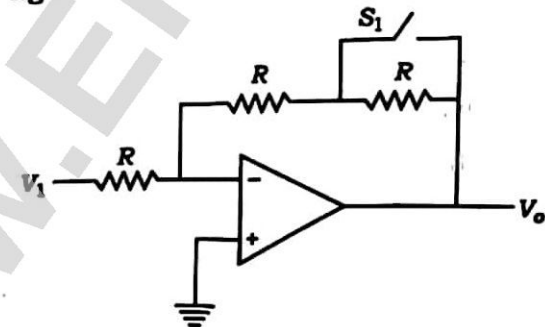
(b) A D/A converter with a full-scale output voltage of 3.5 V has a resolution close to 14 mV. Its bit size is

- (i) 4
- (ii) 8
- (iii) 16
- (iv) 32

(c) A first-order LPF is given with $R = 50 \text{ ohm}$ and $C = 5 \mu\text{F}$. What is the frequency at which the gain of voltage transfer function of the filter is 0.25?

- (i) 4.92 kHz
- (ii) 0.49 kHz
- (iii) 2.46 kHz
- (iv) 24.6 kHz

(d) Let the magnitude of the gain in the inverting op-amp circuit shown in the figure below be X with switch S_1 open :

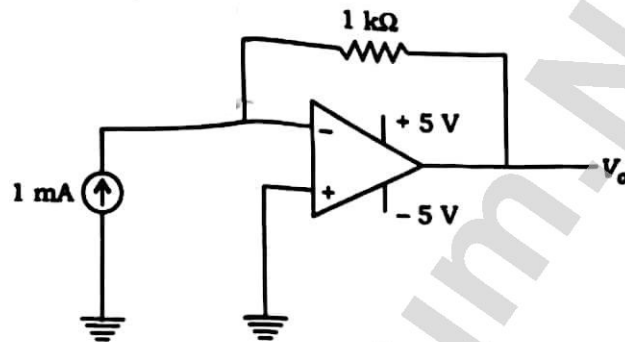


When the switch S_1 is closed, the magnitude of gain becomes

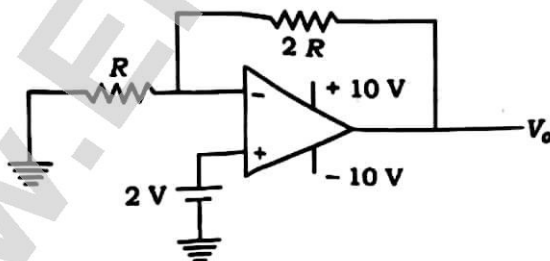
- (i) $X/2$
- (ii) $-X$
- (iii) $2X$
- (iv) $-2X$

8AK/383**(Continued)**

(3)

(e) Find V_o .

- (i) +5 V
- (ii) -5 V
- (iii) +1 V
- (iv) -1 V

(f) Find V_o .

- (i) 4 V
- (ii) 7.5 V
- (iii) 6 V
- (iv) 12.12 V

(Turn Over)

(4)

(g) A major advantage of active filters is that they can be realised without using

- (i) op-amps
- (ii) inductors
- (iii) resistors
- (iv) capacitors

(h) If the resolution of D/A converter is approx. 5% of its full-scale range, then it is an/a

- (i) 8-bit converter
- (ii) 10-bit converter
- (iii) 12-bit converter
- (iv) 16-bit converter

(i) What is the conversion rate for a double-buffered ADC, where the scanner settling time is 5 μ sec, the sample hold aperture time 100 ns, the A/D conversion is 14.8 μ sec and the double-buffer load time is 100 ns?

(j) Draw buffer circuit and explain its application.

3AK/383

8AK/383

(Continued)

(5)

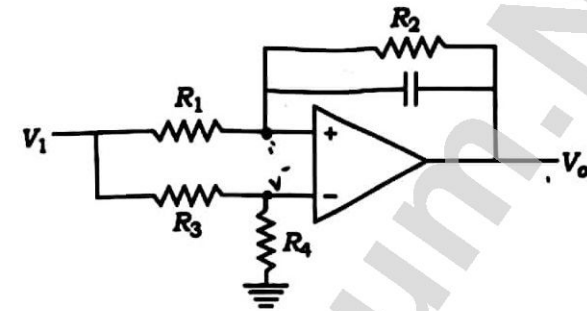
2. (a) Compare and contrast between the adder and ladder methods of digital-to-analogue conversions.
- (b) Produce a table to characteristics, advantages and disadvantages. 7+7
3. (a) Compare and contrast between the counter and successive methods of analogue-to-digital conversions.
- (b) An 8-bit unipolar successive approx register-type ADC is used to convert 3.5 V to digital equivalent output. The reference voltage is +5 V. What is the output of ADC at the end of 3rd clock pulse after the start of conversion? 7+7
4. If a 1 MHz clock is connected to a 10-bit counter-type ADC operating in the range ± 10 V, what is—
- (a) the maximum conversion time;
- (b) the time to convert +5.1 V? 7+7
5. (a) Draw the circuit diagram of practical differentiator and derive the input-output relation for the same.

8AK/383

(Turn Over)

(6)

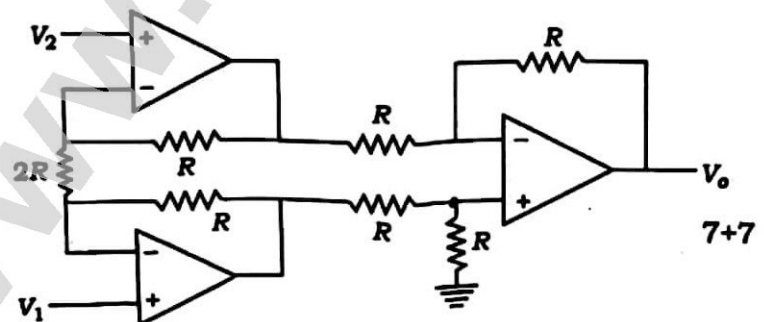
- (b) A general filter circuit is shown in the figure below :



If $R_1 = R_2 = R_a$ and $R_3 = R_4 = R_b$, then the circuit is which type of filter? Derive its transfer function. 7+7

6. (a) Draw the block diagram of intelligent instrument and discuss its different blocks.

(b) Find V_o .



8AK/383

(Continued)

(7)

7. (a) What is basically the concept of smart sensors? What are the essential elements in such unit?
- (b) Show with the help of diagram, the arrangement of these elements. 7+7
8. (a) Show with the help of diagrams, how the primary sensors are being integrated with signal processing ensembles. What are the essential components in the signal processing unit?
- (b) What is a ring oscillator? How has it been integrated? Where in a smart sensor, is it likely to be used? 7+7
9. (a) Describe the principles of a smart transmitter. What and where does it transmit?
- (b) Discuss some aspects of its development in recent years. 7+7
