7 ADC and DAC

Multiple Choice Questions

Q.1 The resolution of a 12 bit Analog to Digital converter in percent is

(a) 0.01220 (b) 0.02441

(c) 0.04882 (d) 0.09760

[ESE-2002(EE)]

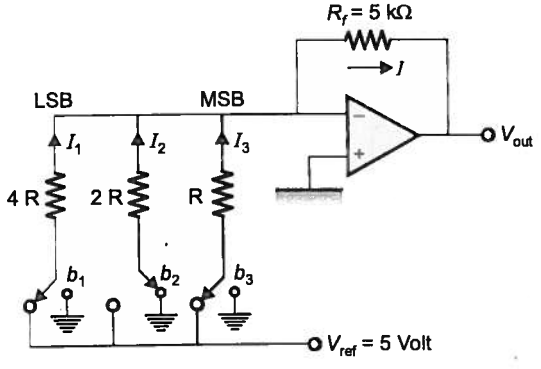
Q.2 Consider a 6-bit D/A converter having full scale output of 3 mA and a full-scale error of ±0.4% FS. For a binary input sequence of 1 0 1 1 1 1, the range of possible outputs will be

(a) (2220 2240) μA (b) (492 – 512) μA

(c) (2226 – 2250) μA (d)(1295 – 1325) μA

Linked Data for Questions (3 and 4):

A 3-bit weighted resistor D/A converter with MSB resistance $R = 10\ k\Omega$ having input bit stream $b_3\, b_2\, b_1 = 1\ 0\ 1$ is shown in figure below:



Q.3 The total input current 'I' in the circuit will be

(a) 0.125 mA (b) 0.5 mA

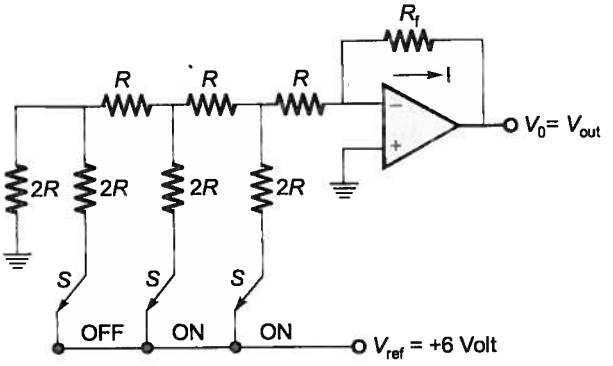
(c) 0.625 mA (d) 1.0 mA

Q.4 What is the analog output voltage by this DAC?

(a) –3.125 volt (b) –0.625 volt

(c) –2.5 volt (d) –5.0 volt

Q.5 The circuit shown below is a R-2R ladder type DAC with reference voltage +6 V and $R_f = 9\ k\Omega$ and $R = 1\ k\Omega$.



As above figure-2 switches are ON and 1 is OFF, the output voltage will be

(a) –6.75 V (b) –13.5 V

(c) –20.25 V (d) –40.5 V

Q.6 The output voltage of a 5-bit D/A binary ladder that has a digital input of 11010 (Assuming 0 = 0 V and 1 = +10 V) is

(a) 3.4375 V (b) 6.0 V

(c) 8.125 V (d) 9.6875 V

[ESE-2001]

Q.7 Which one of the following D/A converters has the resolution of approximately 0.4% of its full scale range?

(a) 8-bit (b) 10-bit

(c) 12-bit (d) 16-bit [ESE-2006]

Q.8 An 8 bit successive approximation analog to digital converter has full scale reading of 2.55 V and its conversion time for an analog input of 1 V is 20 μs. The conversion time for a 2 V input will be

(a) 10 μs (b) 20 μs
(c) 40 μs (d) 50 μs

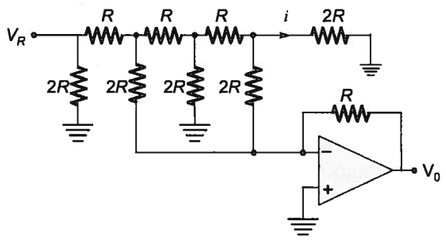
[GATE-2000]

Q.9 The minimum number of comparators required to build an 8 bit flash ADC is
(a) 8 (b) 63
(c) 255 (d) 256

[GATE-2002]

Q.10 4 bit binary weighted resistor *DAC* has *LSB* resistance of 32 kΩ. The corresponding *MSB* resistance is
(a) 2 kΩ (b) 4 kΩ
(c) 8 kΩ (d) 32 kΩ

Statement for Linked Answer Questions (11 and 12):
In the Digital-to-Analog converter circuit shown in the figure below, V_R = 10 V and R = 10 kΩ.



[GATE-EC:2007]

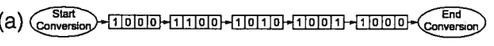
Q.11 The current i is
(a) 31.25 μA (b) 62.5 μA
(c) 125 μA (d) 250 μA

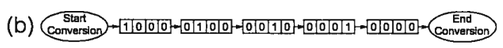
[GATE-EC:2007]

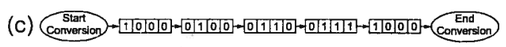
Q.12 The voltage V_0 is
(a) –0.781 V (b) –1.562 V
(c) –3.125 V (d) –6.250 V

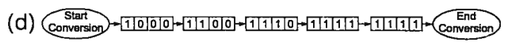
[GATE-EC:2007]

Q.13 A 4-bit successive approximation type ADC has a full scale value of 15 V. The sequence of the states, the SAR will traverse, for the conversion of an input of 8.15 V is

(a) 

(b) 

(c) 

(d) 

[GATE-IN:2010]

Q.14 Which of the following statements is/are correct about Analog to Digital converters (ADCs).
(i) Flash type ADCs are fastest
(ii) In successive approximation type ADCs conversion time depends on magnitude of analog voltage.
(iii) Counter type ADCs has fixed conversion time
(iv) Dual-slope type ADCs are slowest
(a) All of these (b) (ii) and (iii)
(c) (i) and (iv) (d) (i) only

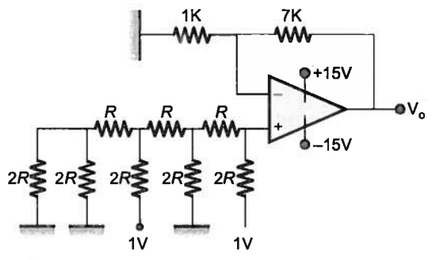
Q.15 For a 4-bit digital to analog convertor, analog voltage varies from 0 to 1.5 volts. The resolution of DAC is
(a) 10 % (b) 6.25 %
(c) 6.67 % (d) 9.375 %

Numerical Data Type Questions

Q.16 An 8-bit D/A converter has a full scale output voltage of 20 V. The output voltage when the input is 11011011, is _____ V.

[ESE-2001]

Q.17 For the 4 bit DAC shown in the figure, the output voltage V_0 is _____ V.



[GATE-2000]

Q.18 A 10-bit DAC provides an analog output which has a maximum value of 10.23 volts. Resolution of the DAC is_____ mV.

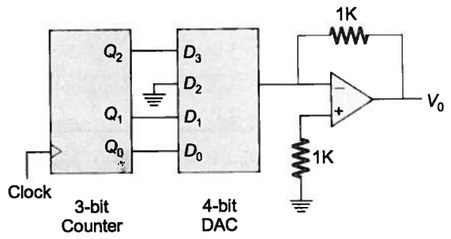
[ESE-2012]

Q.19 The analog output voltage of a 6 bit DAC with reference voltage as 20 V for the digital input 011101 is ____ Volts.

Q.20 A 5 bit D/A converter has a current output. If an output current I_{out} = 10 mA is product for a digital input of 10100, the value of I_{out} for a digital input of 11101 will be_____mA.

Try Yourself

T1. A 4-bit D/A converter is connected to a free-running 3-bit UP counter, as shown in the following figure. Which of the following waveforms will be observed at V_0?



In the figure shown above, the ground has been shown by the symbol ∇.

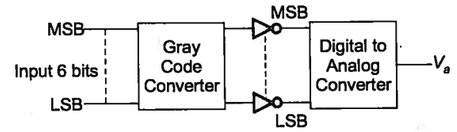
(a) 
(b) 
(c) 
(d) 

[GATE-2006]

T2. A 8-bit A/D convertor is used over a span of zero to 2.56 V. The binary represen-tation of 1.0 V signal is
(a) 011 001 00 (b) 011 100 01
(c) 101 001 01 (d) 101 000 10

[ESE-2013]

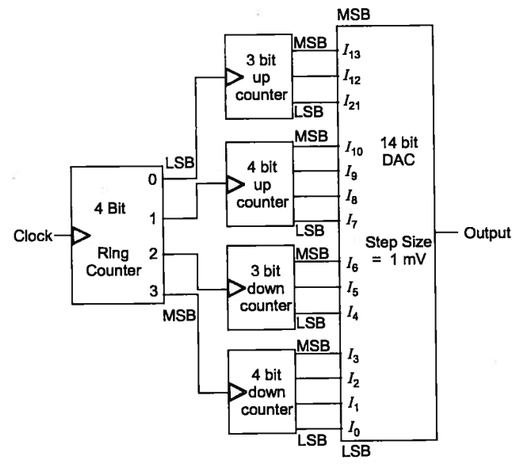
T3. Consider the circuit given below.



The full scale reading of Digital to Analog converter is 10.5 V. Each bit of Gray code converter output is given to digital to analog converter through an invertor. If input to the circuit is 110011, then corresponding output voltage V_a is ____ Volts.

[Ans: 3.45 V]

T4. Consider the system given below:



The clock input is connected to the 4 bit ring counter. The output of the ring counter acts as the clock for the other counters. All the counters shown in figure are positive edge triggered. The output of all counters act as input to a 14 bit DAC with step size (D) equal to 1 mV. If initially all counter are cleared then find the output of DAC after 20 clock pulses.

[Ans: 10.96 V]