Name & Reg No:

Answer the following questions,

a. What will be transmission rate of MCU-1 and MCU-2 in bits per second. b. What sampling rate will you choose for ADC-1 and ADC-2. How you did it?

c. Assuming sampling frequency(10 x Input sine wave frequency) d. If you choose X Hz as the fastest possible frequency of input sine waves. Which component will be the problematic at (X+1) Hz. Will it be ADC, DAC, Serial Comm or something

else? Prove mathematically..

e. Add the timing diagram of input sine wave signal and output of DAC. Show the amplitude

and time period. f. Can we sample both ADCs with the same sampling rate? Under what conditions we can

do that? Use timers for precise calculations. Clearly write the code for both MCUs.

Q2).

20-points

CLO-6/PLO-4 [Cognitive Domain: Application] 1. Using an appropriate equation of ADC, determine the output (D\_out) for the following two cases,

a) Vin=1.5V, Vref= 3.3V, ADC is 8-bits b) Vin=2.0V, Vref=5VV, ADC is 12-bits

2. What is the resolution of ADC for the following two cases,

a. Vref= 5V, ADC is 16-bits b. Vref=3.3V, ADC is 12-bits

c. Vref= 5V, ADC is 8-bits

3. In ideal case, the maximum quantization error in ADC:

4. If ADC conversion time is 150usec. Sampling rate is ten times of input signal frequency. How high can be the frequency of input signal?

5. If voltage of analog input signal (Vin) varies from 0-5V. What should be the dynamic range of

ADC: . How to generate a data rate of 4800 bps at UART. 6

a. Clock frequency: =

b. Machine cycle frequency=

c. THI=

d. Bit duration will be:

e. Total bits in a frame:

f. Frame duration will be:

7. Draw the timing diagram of a frame of UART, include overhead bits.

a. Data = 0xFF, b. Data = 0x00,

c. Data = 0x81,

d. Data = 0xAA

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Qno2 solution:

Sure! Let's calculate the output (D\_out) and the resolution of the ADC for the given cases:

1. Case a: Vin = 1.5V Vref = 3.3V ADC is 8-bits

The equation to calculate D\_out for an 8-bit ADC is: D\_out = (Vin / Vref) \* (2^N - 1) where N is the number of bits of the ADC.

Plugging in the values: D\_out = (1.5 / 3.3) \* (2^8 - 1) = (0.4545) \* (256 - 1) = 116.3636

Therefore, the output D\_out for this case is approximately 116.36.

1. Case b: Vin = 2.0V Vref = 5V ADC is 12-bits

Using the same equation: D\_out = (Vin / Vref) \* (2^N - 1)

Plugging in the values: D\_out = (2.0 / 5) \* (2^12 - 1) = (0.4) \* (4096 - 1) = 1638.4

Therefore, the output D\_out for this case is approximately 1638.4.

Now, let's calculate the resolution for the given cases:

a. Vref = 5V, ADC is 16-bits

The resolution (R) of an ADC is calculated using the formula: R = Vref / (2^N) where N is the number of bits of the ADC.

Plugging in the values: R = 5 / (2^16) = 5 / 65536 ≈ 0.0000763V

Therefore, the resolution for this case is approximately 0.0000763V.

b. Vref = 3.3V, ADC is 12-bits

Using the same formula: R = 3.3 / (2^12) = 3.3 / 4096 ≈ 0.0008057V

Therefore, the resolution for this case is approximately 0.0008057V.

c. Vref = 5V, ADC is 8-bits

Plugging the values into the formula: R = 5 / (2^8) = 5 / 256 ≈ 0.01953V

Therefore, the resolution for this case is approximately 0.01953V.