

CPE 323 Embedded Systems
Fall 2020 Final Exam Formula Sheet

Basic but Useful Formulas

1. To find range between memory addresses:

- a. $range = end - start + 1$

- b. Ex: $4KB = end - 0x0000 + 0x0001$

ADCs and DACs

1. To find TxCCR0 (Configure timer and where x is A or B):

- a. $TxCCR0 = \frac{Total\ System\ Clock\ Cycles}{\#\ of\ interrupts\ per\ second} - 1$

2. ADC or DAC Precision:

- a. Number next to ADC or DAC is processed as:

- i. $2^n - 1$

3. To find number of interrupts a Timer ISR can generate:

- a. $\#interrupts\ per\ sec = frequency \times samples\ per\ second$

4. To find frequency:

- a. $f = \frac{1}{T}$

5. To find lookup table value:

- a. $\frac{x - min}{max - min} \times (2^{n\ bits} - 1)$

Time, Timers, Operating Time

1. Amount of MCLK ccs in one ACLK ccs:

a. $\frac{ACLK}{MCLK}$

2. Total active and sleep time during one application cycle when given samples per sec (Fall sample final):

a. $CPU\ cc = \frac{total\ system\ cc}{\# samples\ per\ second}$

b. $Active\ cc = \# samples\ per\ second + processor\ cc$

c. $LPM\ cc = CPU\ cc - active\ cc$

d. $Active\ \% = \frac{active\ cc}{CPU\ cc}$

e. $LPM\ \% = \frac{LPM\ cc}{CPU\ cc}$

3. Total active and sleep time during one application cycle when given it in a time variable (ms) (Spring Sample Final):

a. $Active\ time = processor\ cc \times \left(\frac{1}{Total\ clock\ freq\ (MCLK)} \right)$

b. $LPM\ time = application\ cycle - active\ time$

c. $I_{avg} = \left(\frac{active\ time\ (in\ ms)}{app\ cycle\ (in\ ms)} \right) \times active\ amps + \left(\frac{LPM\ time\ (in\ ms)}{app\ cycle} \right) \times LPM\ amps$

4. Average Current Drawn by MSP430:

a. $I_{avg} = \left(\frac{Active\ cc}{CPU\ cc} \right) \times current\ for\ active + \left(\frac{LPM\ cc}{CPU\ cc} \right) \times current\ for\ LPM$

5. Total Power consumed:

a. $P = V \times I_{avg}$

6. System Operating Time

a. $Operating\ Time = \frac{Battery\ Capacity}{I_{avg}}$

UART Serial Communication

1. Amount of time in seconds to transfer char:

- a. $\frac{\text{total \# of bits}}{\text{total bits per second}} = n \text{ milliseconds}$

- 2.