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. $Active\ time = processor\ cc \times (\frac{1}{Total\ clock\ freq\ (MCLK)})$
    b. $LPM\ time = application\ cycle - active\ time$
    c. $I_{avg} = \left(\frac{active\ time\ (in\ ms)}{app\ cycle\ (in\ ms)}\right) \times active\ amps + (\frac{LPM\ time\ (in\ ms)}{app\ cycle}) \times LPM\ amps$
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. $\frac{total\ \#\ of\ bits}{total\ bits\ per\ second} = n\ milliseconds$
2.