**CSCI 40300/ECE 40800**
**Operating Systems– Fall 2016**
**Quiz 11**
**Solutions**

Name: _____

| Question: | 1 | 2 | Total |
|---|---|---|---|
| Points: | 5 | 5 | 10 |
| Score: | | | |

Normalized Total to $100 = 100 \times \text{Total}/10 =$ _____ (what will appear in Canvas gradebook).

1. (5 points) Given the following reference string of pages required for a process. The number of page frames allocated the processes at a time is 4. Using the LRU page replacement algorithm, determine how many page faults occur. Count initial loads (cold start loads) as page faults.

   1 2 4 3 7 1 3 4 5 7 2 3 4 6

   **Answer:** 12 page faults.

2. (5 points) A small computer has four page frames. At the first clock tick, the R bits are 0111 (page 0 is 0, the rest are 1). At subsequent clock ticks, the values are 1011, 1010, 1101, 0010, 1010, 1100, and 0001. If the aging algorithm is used with an 8-bit counter, give the values of the four counters for each page frame after the last tick.

   **Answer:** The counters are:

   | | |
   |---|---|
   | Page 0 | 01101110 |
   | Page 1 | 01001001 |
   | Page 2 | 00110111 |
   | Page 3 | 10001011 |

   Remember that the R bits are inserted from the most significant bit (i.e., from the left).