**ECE 4960**

**Homework 4**

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* 1. **Programming Environment:**

**Language:**  Matlab, R2013a

**System Type, OS:** 64-bit Windows 10 OS, x64-based Intel® Core™ i7-6700HQ CPU @ 2.6GHz processor

**RAM:** 8 GB

**Model:** Acer Aspire VN7-592G

* 1. **Part 1:**

The code calls functions for different sparse and full matrix operations. Finally validation is done by comparing final matrices using different data structure. Following shows the validation tests and result achieved by the program:

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normTestA = 0

normTestb = 0

* 1. **Part 2:**

The code reads the file given and extracts the data from row third onwards. The first column shows row coordinate, second column is column coordinate and third column shows the value. First step is to convert the given coordinate structure to the row-compressed sparse data structure in order to use the same functions as in Part 1. The given operations are performed. The cputime function is used to calculate time taken for all the operations. For memory, memory function is used to get memory before the functions are called and after the functions are called. Total memory usage increase is final – initial. But there is increase in storage due to the operations, which decrease some sparsity. And the storage of b matrix from operation requires additional memory. The calculation is shown as below:

Array space occupied after operations + b matrix space: *2306904 bytes*

Array space occupied before operations: *2160472 bytes*

matrix occupies: *142064 bytes*

(Sparsity decreased by (2306904-2160472) – 142064 = *4368 bytes*)

The required more storage: 2306904-2160472 = *146432 bytes*

So, the final total memory usage is (final – initial – 146432) bytes. Checksum is calculated by the following equation:

‘Test Successful’ is printed if the value by above equation is less than the tolerance limit of 1e-7. The result generated by the code is:

CPU time taken for these operations is 0.140625 sec

Memory usage increase for these operations is 0.865280 Mb

Test Successful!

CheckSum = 1.0942e-12