**CMSC 132 Quiz 5 Worksheet**

The next quiz of the course will be on Wednesday, November 15 during your lab (discussion) session. The following list provides more information about the quiz:

- The quiz will be a written quiz (no computer).
- Closed book, closed notes quiz.
- Answers must be neat and legible. We recommend that you use pencil and eraser.

The following exercises cover the material to be included in this quiz. Solutions to these exercises will not be provided, but you are welcome to discuss your solutions with TAs and instructors during office hours.

**Thread/Synchronization**

1. What are two advantages to multi-threading?
2. What are two disadvantages to using multi-threading?
3. What are two ways to create threads in Java?
4. What is a daemon thread?
5. What is a deadlock? How can you avoid it?
6. What is a data race? How can you avoid it?
7. Write a Java program called LinePrinter that starts a new thread for each line printed.
8. Write a Java program called ParallelQueue that allows multiple threads to add and remove items to a queue without data races or deadlock.

**Minimum Spanning Trees**

Using the following graph answers the questions that follow.

9. **Minimum Spanning Tree (Using Prim’s Algorithm)**

   When several node choices are available, use alphabetical order to choose a node to process.
a. Generate the minimum spanning tree for the above graph using Prim’s algorithm. Use a as the start vertex.

b. Run Prim’s algorithm using b as the start vertex. Indicate the cost and predecessor for each node in the graph, after three nodes have been added to the set of processed nodes (set S in the lecture slides). You don’t need to draw a tree.

10. Minimum Spanning Tree (Using Kruskal’s Algorithm)

a. Generate the minimum spanning tree for the above graph using Kruskal’s algorithm.

b. Run Kruskal’s algorithm in the above graph and draw the graph we will have after only four edges have been processed.