50 points. 75 minutes. Open book/notes. Name: _____

1. Consider sorting *n* numbers stored in an array *A* by first finding the smallest element of *A* and exchanging it with the element *A*[1] (first element in the array). Then find the second smallest element of *A*, and exchange it with *A*[2] (second element in the array). Continue in this manner for the first *n-1* elements of *A*.
   a. Write pseudocode for this algorithm. **[8 points]**
   b. Explain how to compute the best-case and worst-case running times for this sorting algorithm in Θ–notation? [**3 + 3 points**]

2. Illustrate the operation of building a min-heap on the sequence 5, 3, 17, 10, 84, 19, 6, 22, 9. Also write down the corresponding min-heap data structure after the element with the minimum value is removed from the heap and the heap is rebuilt. **[8 + 4 points]**

3. Design a version of the quicksort algorithm that uses the middle element as the pivot value and write the pseudocode for this algorithm. Illustrate the operation of sorting the sequence 3, 41, 52, 26, 38, 57, 9, 49 using this version of quicksort algorithm. **[8 + 6 points]**

4. Illustrate the operation of RADIX-SORT on the following list of English words:
COW, DOG, RUG, TAR, DIG, BIG, NOW, FOX. [**6 points**]

5. Explain the differences between mergesort and quicksort. [**4 points**]