Sample Final Exam

1) Convert each of the following expressions into its equivalent prefix, postfix or infix expressions (in other words, provide the alternatives to the one given):

   a) prefix expression: \( / - + 9 9 + * 2 3 4 2 \)

      infix: 

      postfix: 

   b) postfix expression: \( a b % c - d + e f * * \)

      infix: 

      prefix: 

   c) infix expression: \( (\pi * \epsilon) + ((\omega - \rho) / (\beta + \alpha)) * \eta \)

      prefix: 

      postfix:
2) Draw the graph represented by the adjacency matrix shown below:

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<th>3</th>
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</tbody>
</table>

3) Show how the following graph may be represented by an array of edge lists:
4) Draw the B-tree with MINIMUM = 2 that is formed by the following data entries (in the given order):
5, 29, 83, 41, 9, 3, 39, 94, 70, 18, 58, 66, 10, 46, 82, 95, 79, 15, 20, 11

5) Show the changes that occur in the b-tree you drew in question 3 when the following values are removed:
   - 66
   - 83
   - 46
6) What would be the effect of doubling the size of the data set on execution times of algorithms with the following Big O values?
   a. O(log N)
   b. O(N²)
   c. O(1)
   d. O(N)
   e. O(k^N)

7) Suppose you are given the task of creating an index for a textbook. To automate the process, you will create a database of keywords from the text, eliminate extraneous words ("and," "it," "the," etc.), then attach relevant page numbers to the significant keywords, and print the resulting index in alphabetical order. Describe the data structures you would use to solve this problem and the associated algorithms you would apply. Be specific – explain why each structure/algorithm is the best for this situation. What values do you need to have on hand, and how will you store and retrieve them?