PRACTICE EXAM

Difficulty: MEDIUM

Questions: 10

Algorithms and Data Structures Exam

Instructions:

Answer all questions to the best of your ability. Read each question carefully and provide complete answers.

Section 1: Multiple Choice Questions (4 points each, 40 points total)

Instructions: Choose the best answer for each question.

Question 1: According to the provided information, what is an algorithm?
A) A complex mathematical equation
B) A set of random instructions
C) A well-defined computational procedure that transforms inputs into outputs
D) A computer program written in a specific language

Question 2: Which of the following is NOT a required characteristic of an algorithm?
A) Finiteness
B) Ambiguity
C) Definiteness
D) Input

Question 3: What is the purpose of the outer loop ("for j ← 2 to n") in the provided INSERTION-SORT pseudocode?
A) To iterate through the already sorted portion of the array
B) To select the key element to be inserted into the sorted portion
C) To compare elements within the sorted portion
D) To define the index

Question 4: Who is the professor for COE428: Engineering Algorithms & Data Structures, according to the material?
A) Thomas H. Cormen
B) Ronald L. Rivest
C) Charles E. Leiserson
D) Reza Sedaghat

Section 2: Short Answer Questions (6 points each, 30 points total)

Instructions: Answer each question in 2-3 complete sentences.

Question 5: Explain the problem that sorting algorithms aim to solve.

Question 6: In the context of the provided INSERTION-SORT pseudocode, what is the role of the 'key' variable?

Question 7: Briefly describe what the 'Merging two sorted arrays' represents in the given text.

Section 3: Problem-Solving Questions (10 points each, 30 points total)

Instructions: Provide detailed solutions and explanations for each problem. Show all your work.

Question 8: Trace the execution of the INSERTION-SORT algorithm on the following array: `[5, 1, 4, 2, 8]`. Show the state of the array after each iteration of the outer loop (i.e., after each value of `j`).

Question 9: The provided text includes a sequence of numbers and the title 'Merging two sorted arrays'. Based on the data provided, demonstrate one step of merging two sorted arrays, such as `[1, 2, 7, 9]` and `[11, 12, 13, 20]`. What is the state of the merged array after adding two numbers?

Question 10: Explain how the inner `while` loop in the INSERTION-SORT pseudocode contributes to sorting the array. What condition must be met for the loop to continue executing?