

Parallel and Distributed Computing Final Exam

LEVEL 1: (4 points each)

1. Differentiate between SIMD and MIMD? Explain.
2. What are the performance metrics of parallel systems? Explain each.
3. How does the performance of metrics of parallel systems affect each other? Explain.
4. Explain what pipelining is.
5. Illustrate and explain what a Von Neuman Architecture is.

LEVEL 2: (5 points each)

1. How does parallel programming/computing works? What do you think will be the advantage of utilizing parallel approach?
2. In a right triangle, the square of the length of one side is equal to the sum of the squares of the lengths of the other two sides. Write a program that prompts the user to enter the length of the three sides of a triangle and then outputs a message indicating whether the triangle is a right triangle.
3. Write a program that prompts the user to input a number between 0 and 35. If the number is less than or equal to 9, the program should output the number; otherwise, it should output A for 10, B for 11, C for 12... and Z for 35.
4. Write a program that will display all numbers divisible by 3, 4 and 5 from 1-50.

LEVEL 3: (6 points each, +2 points if you get 2 LEVEL 3 questions correct.)

1. Differentiate between Multiprocessing and Multithreading. Explain.
2. Explain the difference between Serial Computing and Parallel Computing.
3. Create a function in Python that accepts two parameters. The first will be a list of numbers. The second parameter will be a string that can be one of the following values: asc, desc, and none. If the second parameter is "asc," then the function should return a list with the numbers in ascending order. If it's "desc," then the list should be in descending order, and if it's "none," it should return the original list unaltered.

LEVEL 4: (10 points each)

1. Write a program that will generate 100 3-digit random numbers and store it in a list. The program should display the following:
 - a. All elements in the list
 - b. All numbers grouped by odd and even numbers
 - c. All numbers divisible by 9.
 - d. All prime numbers
 - e. All numbers that contains the digit 9 (e.g 29, 91, 393, 961)
2. Given a linked list of size K, your task is to complete the function `sum_of_lastN_nodes()`, which should return the sum of last N nodes of the linked list. The function takes two arguments as input, the reference pointer of the head of the linked list and the integer N.

Example:

5->10->6->4->1->12

N = 3

`sum_of_lastN_nodes(6, N)`

Output: Sum of last three nodes in the linked list is $4 + 1 + 12 = 15$.

LEVEL 5: (20 points)

1. Flatten the given Linked list

Sorting must be performed during the flattening of the linked list.

