DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
NATIONAL INSTITUTE OF TECHNOLOGY
TIRUCHIRAPPALLI - 620 015, TAMIL NADU, INDIA

CYCLE TEST-1
CSPC51 – COMPUTER ARCHITECTURE

Branch/Semester/Sec : CSE/V/A Time: 03:30 PM to 04.30 PM

Date : 30.8.2024 Max Marks: 20

Answer All Questions

1. A Company is releasing three modification versions of its processor architecture. The modification that are being considered have multiple ramifications to the three major components (X, Y & Z) of the processor. The ramifications are outlined in the following table, in which each entry denotes the factor by which the speedup of that component in the column header will be affected. The fractions of the total execution time for the three components X, Y & Z are 30%, 45% & 25% respectively, identify the speedups (or slow down) that are to be expected from each of these three modification versions. Rank the modifications in terms of speedup.

	X	Y	Z
A	1.4	0.8	1.5
B	0.6	1.6	1.8
C	1.3	1.4	0.9

[6]

2. Let there are two operations to be performed: one is a product of 3 scalar variables, and one is a matrix sum of a pair of two-dimensional arrays, with dimensions 9 by 9. For now let's assume only the matrix sum is parallelizable;
   i. What speed-up do you get with 10 versus 40 processors?
   ii. Calculate the speed-ups assuming the matrices grow to 20 by 20.

[3+3=6]

3. Suppose you are designing a system for a real time application in which specific deadlines must be met. Finishing the computation faster gains nothing. Find that your system can execute the necessary code, in the worst case twice as fast as necessary.
   a. How much energy do you save if you execute at the current speed and turn off the system when the computation is complete?
   b. How much energy do you save if you set the voltage and frequency to be half as much?

[2+3=5]

4. A program with 2000 instructions has 40% branch instructions, 40% load-store instructions and the rest are ALU instructions. The program is running on a processor operating at 5 GHz. The CPI of branch, load-store, and ALU instructions are 2, 2, and 3 respectively. What is the execution time of this program in microseconds (correct to 2 decimal places)?

[3]