National University of Computer and Emerging Sciences, Lahore Campus

Course:	Parallel and Distributed Computing	**Course Code:**	CS-3006
Program:	BSCS & BSDS	**Semester:**	Spring 2024
Duration:	7 Days	**Total Marks:**	24
Submit Date:	22-Feb-2024	**Weight**	2.5%
Type:	Announced	**Page(s):**	2
Exam:	Assignment 01	**Section:**	BDS 6A

Name & Roll No:

Due Date: 20 February, 2024 during lecture time
Submission Mode & Time: Handwritten solutions to be submitted during the lecture.
You must have to write all the steps involved in the solution. State your answers in the readable handwriting and with the help of diagrams, where necessary.

Question # 1:   **[2 + 2 + 1 marks, CLO # 3]**

Suppose we have a system with one processor and a serial program. We want to upgrade this system and we have the following two options.

   i.   Increase the number of processors from 1 to 8 and parallelize 40% of the code.
   ii. Increase the number of processors from 1 to 4 and parallelize 70% of the code.

Calculate speedup in each case and identify which one is better?

Question # 2:   **[2 + 2 + 1 marks, CLO # 3]**

Assume a sequential program *S* has an execution time of 400 seconds. Further, assume that S_p is a parallel variant of *S*. After an experimental evaluation over different number of processors, the following running times were achieved:

P	2	4	6	8
Execution Time (seconds)	214	123.84	96.62	84.92
Speedup				
Karp-Flatt Metric				

   a) Calculate Speedups for each of the experimental configurations in the space provided below and then write your answers in the table above.

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b) Calculate the Karp-Flatt metric values in the space provided below and then write your answers in the table above. You also have to interpret the results of Karp-Flatt metric and write your opinion below.

**Question # 3:**   **[6 marks, CLO # 1]**

Explain approaches used for multithreading in the SISD architecture. Use diagrams where required.

Question # 4:   **[2 + 2 + 2 + 2 marks, CLO # 3]**

Calculate (a) cost (b) diameter (c) bisection width and (d) arc connectivity for:

i.   **4x4 two-dimensional mesh with wraparound links**

ii.   **4x4 two -dimensional mesh with no wraparound links**

iii.   **Four-dimensional hypercube (size=16 Nodes)**
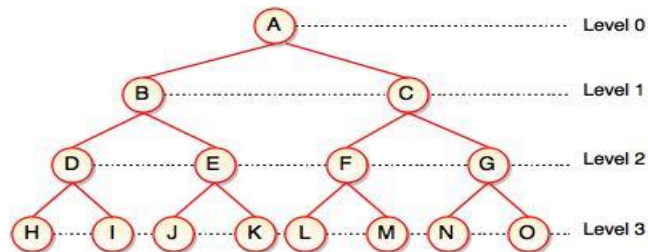

4D
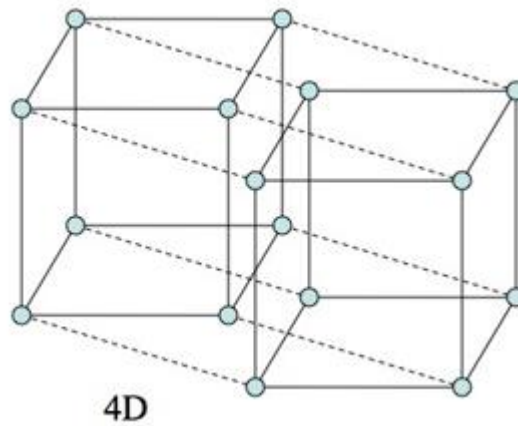
iv.   **A complete binary tree of 3 levels as shown in the image below:**

Fig. Complete Binary Tree