**Midterm SC – CUNY**

Your name:

Your ID:

Your CUNY ID:

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Rules:

1. Please type all your answers. Send answer to me: [alexander.tzanov@csi.cuny.edu](mailto:alexander.tzanov@csi.cuny.edu) in electronic format. Please use the provided Doc file and write:

Your name

Your ID

Your CUNY ID

On top of each page.

1. Use the following line for the subject line for e-mail: - **Midterm\_Your\_name\_SC\_CUNY. Example: Midterm\_joe\_doe\_SC\_CUNY**
2. You have to send me the answers by **Thursday noon (12AM).** All late works will not be graded.
3. Use the format of the midterm and place your answer after each question so each question is followed by your answer.

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Q1. (5 points) Consider a two-dimensional mesh network with **n** rows and **m** columns. What is the bisection bandwidth of this network?

Q2 (5 points) A program is written for parallel multiplication of 2 matrices of size . It uses standard matrix multiplication method raw by column. What type(s) of parallelism this program can utilize? Describe fully your answer.

Q3. (5 points) In SMP architecture what are benefits of shared cache?

Q4. (5 points) Explain “memory wall “ and how that effects the performance?

Q3. (10 points) Consider following instructions. Determine all flow, anti, and output dependences and draw the resulting data dependence graph. Is it possible to execute some of these instructions parallel to each other?



Q3. (10 pts) Consider the following loop:



Can it be transformed to equivalent forall loop? Explain your answer.

Q4. (20 pts. ) Consider following 2 loops



Are they perform the same computations? Explain your answer.

Q5. (20pts) Develop the program with use of 6 main MPI instructions – send receive, init, rank, finalize, communicator which calculates prime numbers between 1 and N. Explain your answer and leave the code in your home directory on server so I can look in it. Print the complete code in your answer together with result.

Q6. (20 pts) Write a simple code with use of 6 main MPI instructions which calculate Fibonacci numbers. Run the code with 2, 4, 8, 16 cores with large number (i.e. 100 000) and report time in graph form. Print the complete code in your paper and also leave the code in your home directory on cluster.