**Question1**.

File: a2q1.c

Compile Code:  
mpicc -o a2q1.x a2q1.c

mpirun -np 4 ./test.x 10

On School’s server, for running up to around 30s, can use:  
mpirun -np 100 ./test.x 1000

Analysis:

Big O = n log n for one process, n = N/p

If based on Amdahl’s Law, A black and white text

Description automatically generated,

After running 82% of time on execution.   
f = 1 – 0.82 = 0.18

Max Speed (S) is when p is infinity, so Max S = 1/(0.18) = 5.556

When P = 100 , 1/(0.25 + 0.75/8) = 5.31

Output:

A computer screen with numbers and letters

Description automatically generated

**Question2**.

**Part1** file: a2q2p1.c

Compile Code:  
mpicc -o a2q2p1.x a2q2p1.c

./a2q2p1.x 3000 3000

Core Function:

void computeCumulativeSum(int rows, int cols, int \*\*A, int \*\*B)

Output:

A black screen with white text

Description automatically generated

**Part2** file: a2q2p2.c

Compile Code:

mpicc -o a2q2p2.x a2q2p2.c  
OMP\_NUM\_THREADS=4 ./a2q2p2.x 3000 3000

or  
mpirun -np 4 ./a2q2p2.x 3000 3000

Core Function:

void computeCumulativeSumParallel(int rows, int cols, int \*\*A, int \*\*B)

OUTPUT:

  
or  
A screen shot of a computer

Description automatically generated

**Part3** File: a2a2p3.c