King Saud University
College of Computer and Information Sciences
Department of Computer Science
CSC453 – Parallel Processing – Tutorial No – Spring 2022

Question

1. Let's consider that we want to apply the bitonic ***ascending*** merge-sort algorithm on the following array:

5	3	18	12	6	10	14	4

   a. Show all changes made on the array during ***step 1*** of the algorithm.
   {3, 5, 18, 12, 6, 10, 14, 4}

   b. Which threads will be involved in this ***step 1*** in case the algorithm is performed in parallel. Don't forget to specify, for every thread, the index of the cells it will process.
   T0: [0,1] (+)BM T2: [2,3] (-)BM T4: [4,5] (+)BM T6: [6,7] (-)BM

   c. Show all changes made on the array during ***stage 1 of step 2*** of the algorithm.
   {3,5,18,12,14,10,6,4}

   d. Which threads will be involved in this ***stage 1 of step 2*** in case the algorithm is performed in parallel. Don't forget to specify, for every thread, the index of the cells it will process. T0: [0,2] (+)BM T1: [1,3] (+)BM T4: [4,6] (-)BM T5: [5,7] (-)BM

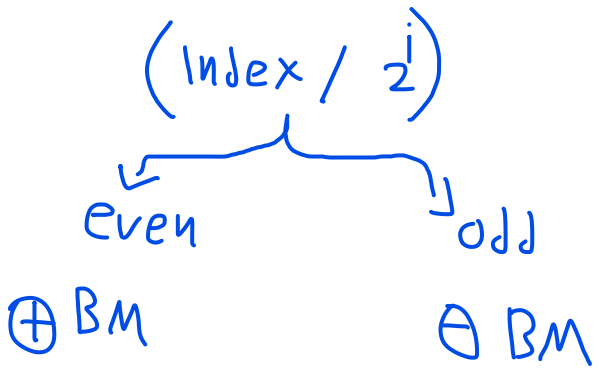
2. Give the number of steps that are required to sort elements of an array of size N. $\log_2(N)$

3. Give the number of stages that are required in a given step ***i***. Stages = i

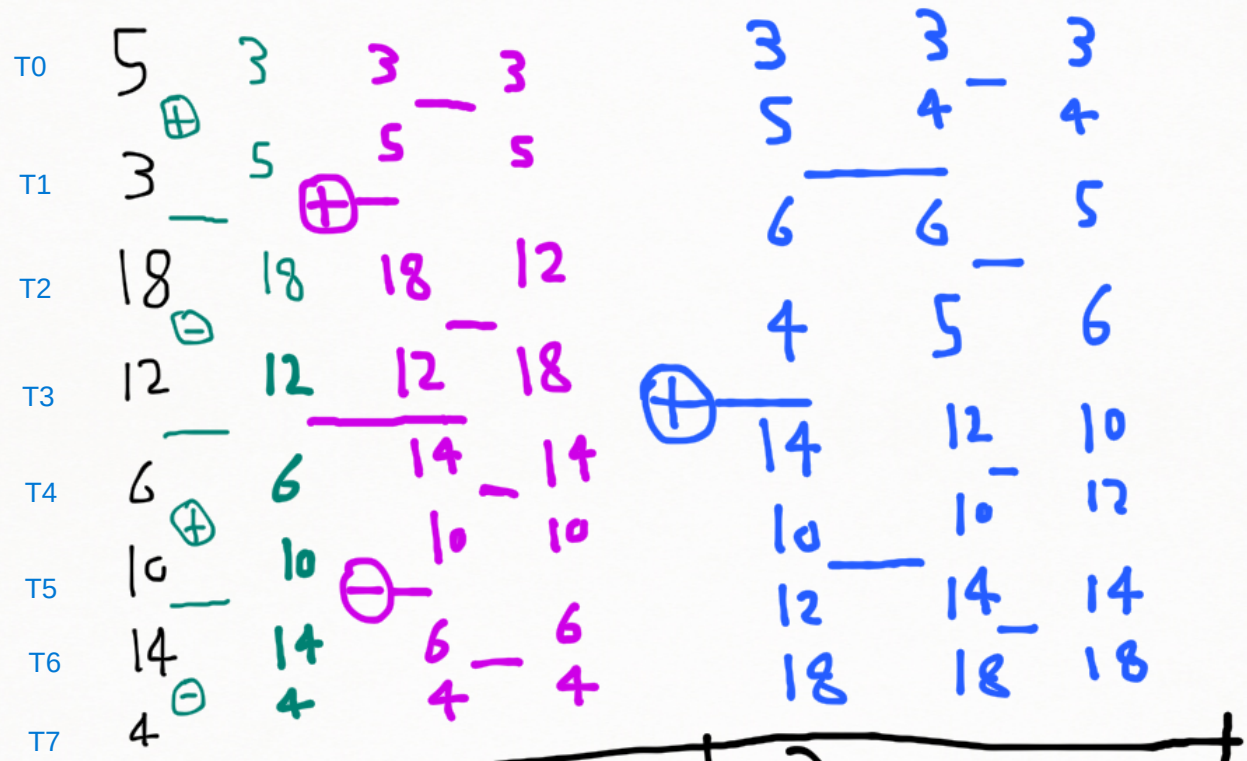
4. Give the size of bitonic sequences in a given stage ***j*** of a step ***i***. 2^{i-j+1}

5. Give the condition that should satisfy a thread to participate in the processing of bitonic sequences of a stage ***j*** of a step ***i***. index % $2^{i-j+1} < 2^{i-j}$

6. Give the condition that should satisfy a thread that participates in the processing of sequences of a stage ***j*** of a step ***i*** to sort its corresponding bitonic-sequence ascendingly.



(5, 3, 18, 12, 6, 10, 14, 4)



Step	1	2		3		
Stage	1	1	2	1	2	3