

# CSE 310 Recitation 5

## Objectives:

1. Exercise on counting sort

## Instruction

1. For all recitation exercise, we highly recommend that you submit a typed solution with the original questions inside; in case you don't have enough time to do so, a hand-written one is acceptable only when: **the solution is clearly written and must be saved in .pdf format**. Note: **unreadable answer receives no credits!**
2. All recitation exercises must be submitted through the link posted on Canvas, we do NOT accept any submissions through emails!

## Question

1. [8 pts] Illustrate the operation of COUNTING-SORT( $A, B, k$ ) on array  $A = \{6, 0, 2, 0, 1, 3, 4, 6, 1, 3, 2\}$ . Note: you need to clearly mark/write array  $B$  and counter array  $C$ 's contents in each step.

<p>A: <table border="1" style="display: inline-table; text-align: center; width: 150px;"> <tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td><td>11</td></tr> <tr><td>6</td><td>0</td><td>2</td><td>0</td><td>1</td><td>3</td><td>4</td><td>6</td><td>1</td><td>3</td><td>2</td></tr> </table></p>	1	2	3	4	5	6	7	8	9	10	11	6	0	2	0	1	3	4	6	1	3	2	<p>C: <table border="1" style="display: inline-table; text-align: center; width: 100px;"> <tr><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> </table></p>	0	1	2	3	4	5	6								<p>C: <table border="1" style="display: inline-table; text-align: center; width: 100px;"> <tr><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> </table></p>	0	1	2	3	4	5	6							
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<p><i>index = 11</i></p> <div style="display: flex; justify-content: space-between;"> <div style="width: 33%;"> <p>B: <table border="1" style="display: inline-table; text-align: center; width: 150px;"> <tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td><td>11</td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> </table></p> </div> <div style="width: 33%;"> <p>C: <table border="1" style="display: inline-table; text-align: center; width: 100px;"> <tr><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> </table></p> </div> </div>			1	2	3	4	5	6	7	8	9	10	11												0	1	2	3	4	5	6																					
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<p><i>index = 6</i></p> <div style="display: flex; justify-content: space-between;"> <div style="width: 33%;"> <p>B: <table border="1" style="display: inline-table; text-align: center; width: 150px;"> <tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td><td>11</td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> </table></p> </div> <div style="width: 33%;"> <p>C: <table border="1" style="display: inline-table; text-align: center; width: 100px;"> <tr><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> </table></p> </div> </div>			1	2	3	4	5	6	7	8	9	10	11												0	1	2	3	4	5	6																					
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<p><i>index = 5</i></p> <div style="display: flex; justify-content: space-between;"> <div style="width: 33%;"> <p>B: <table border="1" style="display: inline-table; text-align: center; width: 150px;"> <tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td><td>11</td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> </table></p> </div> <div style="width: 33%;"> <p>C: <table border="1" style="display: inline-table; text-align: center; width: 100px;"> <tr><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> </table></p> </div> </div>			1	2	3	4	5	6	7	8	9	10	11												0	1	2	3	4	5	6																					
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*index* = 4

	1	2	3	4	5	6	7	8	9	10	11
B:											

	0	1	2	3	4	5	6
C:							

*index* = 3

	1	2	3	4	5	6	7	8	9	10	11
B:											

	0	1	2	3	4	5	6
C:							

*index* = 2

	1	2	3	4	5	6	7	8	9	10	11
B:											

	0	1	2	3	4	5	6
C:							

*index* = 1

	1	2	3	4	5	6	7	8	9	10	11
B:											

	0	1	2	3	4	5	6
C:							

2. Is counting sort stable or not? (Circle one answer)

**Yes**

**No**

3. As above shows, we place the element in decreasing order of the index, thus we have for  $j = A.length$  down to 1 inside the algorithm. If we change it to for  $j = 1$  to  $A.length$ , whether the algorithm still works properly or not? (Circle one answer)

**Yes**

**No**