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Courses » Parallel Algorithms

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# Unit 9 - Week 08: Connected Components, Vertex Colouring and Interconnection Networks Algorithms

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## Course outline

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Week 01: Models of Computation

Week 02: Performance of parallel algorithms, Basic techniques

Week 03: Basic Techniques

Week 04: Comparator Networks; List Colouring

Week 05: An Optimal List Ranking algorithm

Week 06: Applications of Optimal List Ranking algorithm, Expression Tree Evaluation, Merging and Cole's Merge Sort

Week 07: Cole's Merge Sort, Sorting Lower Bound, Connected Components

Week 08: Connected Components, Vertex Colouring and Interconnection Networks Algorithms

Lecture 01: Connected Components (CREW)

Lecture 02: Connected Components, Vertex

## Assessment 8

The due date for submitting this assignment has passed. As per our records you have not submitted this assignment.

Due on 2019-03-27, 23:59 IST.

1) In an undirected graph  $G = (V, E)$  with  $E = \{AB, AC, BD, BF, CD, DF, HJ, HL, JK, JL, KL\}$ , edges AB, AC, DF, HJ and KL are contracted. The number of supervetices in the resultant graph is \_\_\_\_\_.

1 point

- 2
- 3
- 4
- 5

No, the answer is incorrect. Score: 0

Accepted Answers: 4

2) In an undirected graph  $G = (V, E)$  with  $E = \{AB, AC, BD, BF, CD, DF, HJ, HL, JK, JL, KL\}$ , edges AB, AC, DF, HJ and KL are contracted. The number of self-loops in the resultant graph is \_\_\_\_\_.

1 point

- 2
- 3
- 4
- 5

No, the answer is incorrect. Score: 0

Accepted Answers: 5

3) In an undirected graph  $G = (V, E)$  with  $E = \{AB, AC, BD, BF, CD, DF, HJ, HL, JK, JL, KL\}$ , edges AB, AC, DF, HJ and KL are contracted. The number of redundant edges in the resultant graph is \_\_\_\_\_.

1 point

- 2
- 3
- 4
- 5

No, the answer is incorrect. Score: 0

Accepted Answers: 4

4) In an undirected

1 point

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| Week 12: Parallel Complexity Theory          |

DF

No, the answer is incorrect.  
Score: 0

Accepted Answers:  
AF

5) An undirected graph  $G = (V, E)$  has 30 vertices, 38 edges and 12 components. In the star graph that defines the connected components of  $G$ , the number of edges that are not self-loops is \_\_\_\_\_ **1 point**

30  
 18  
 12  
 38

No, the answer is incorrect.  
Score: 0

Accepted Answers:  
18

6) From an undirected graph  $G = (V, E)$  with  $E = \{AB, AC, AF, BD, BF, CD, CH, DF, DH, DJ, FJ, HJ, HL, JK, JL, KL\}$ , in sets  $\{A, D, K\}$ ,  $\{B, J, C\}$ ,  $\{F, L\}$ ,  $\{H\}$  are successively removed and inserted back in the reverse order. Each vertex is given the least colour in  $\{1, 2, 3, 4, 5, 6\}$  that is not in its neighbourhood, when it is inserted back. What is the colour that is given to D? **1 point**

2  
 3  
 4  
 6

No, the answer is incorrect.  
Score: 0

Accepted Answers:  
4

7) The edge set  $E$  of an undirected graph  $G = (V, E)$  with  $V = \{A, B, C, D, F, H, J\}$  is partitioned into two disjoint sets  $E_1$  and  $E_2$ , and the subgraphs induced by  $E_1$  and  $E_2$  on  $V$  are vertex coloured so that vertices  $A, B, C, D, F, H, J$  get colours of 1, 2, 3, 1, 3, 4, 1 and 1, 2, 1, 3, 1, 1, 2 respectively in the two colourings. Combining the two colourings gives a \_\_\_\_\_ vertex colouring of  $G$ . **1 point**

6  
 4  
 3  
 7

No, the answer is incorrect.  
Score: 0

Accepted Answers:  
6

8) For an algorithm that runs on an  $N \times N$  mesh, the initial contents of processor (1,1) will not affect the end-of-the-step-contents of processor  $(N, N)$  for \_\_\_\_\_ steps. **1 point**

$2N - 4$   
  $2N - 3$   
  $2N - 2$   
  $2N - 1$

No, the answer is incorrect.  
Score: 0

Accepted Answers:  
 $2N - 3$

9) On an  $N \times N$  mesh, the Shearsort algorithm runs in  $\Theta(\quad)$  time. **1 point**

$\sqrt{N} \log N$   
  $N^2$   
  $\sqrt{N}$   
  $N \log N$

**No, the answer is incorrect.**  
**Score: 0**  
**Accepted Answers:**  
 $N \log N$

10) In an  $N$ -node linear array, in which every processor holds a bit, odd even transposition sort is run. The rightmost **1 point** 1 occurs at position 8. It will reach its destination in step number \_\_\_\_\_.

$N - 8$   
  $N$   
  $N - 1$   
  $N - 7$

**No, the answer is incorrect.**  
**Score: 0**  
**Accepted Answers:**  
 $N - 7$

11) In a list, the logical order of the vertices is ABCDEFGH. The list is to be ranked from A. The vertices A, B, C, D, E, **1 point** F, G, H have weights of 4, 6, 2, 3, 1, 2, 4, 9 respectively. Vertices C, E and G are spliced out as is done in the list contraction we studied in Lecture 13. What are the new ranks of A, B, D, F and H?

4, 6, 5, 3, 13  
 4, 8, 5, 6, 9  
 4, 6, 3, 3, 1  
 4, 6, 3, 1, 9

**No, the answer is incorrect.**  
**Score: 0**  
**Accepted Answers:**  
 $4, 6, 5, 3, 13$

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