

**Submission Deadline: 16th December, Friday, 11:59PM**

You have to submit both hard and soft copies.

**Softcopy submission:**

- Please write your answers in A4 papers and scan your answer script.
- Rename the file with your student id (e.g "21201123.pdf").
- Submit the pdf file.
- Maximum file size is 10MB.
- The filename should contain your student id only.
- **Failing to follow the submission format will lead to a deduction in marks.**
- **Any sort of plagiarism will not only result in 0 in the assignment but will also result in a 0 in class performance.**
- Submission link: <https://forms.gle/sW1iHSxVaGHekoWJ9>

**No Hardcopy submission.**

**Resources: (Must Study)**

1. [GeeksforGeeks](#)
2. [TakeuForward](#)

1. Suppose you have an implementation of union that is “by-size” and an implementation of find that. Give the parent map (or array) that results from the following sequence:  
union(1,2), union(3,4), union(3,5), union(1,7), union(3, 12), union(0,9), union(8,10), union(8,9), union(7,4), union(2,9) where the unions are:

- a) by size with path compression
- b) by height
- c) by size, but now with path compression

Now show the step by step DSU for each of the above three scenarios. So, your answer will contain the solutions for these three scenarios separately.

2. You are given an undirected graph with  $n$  nodes labeled from  $0$  to  $n - 1$  and a list of edges, where each edge is a pair of nodes  $[u, v]$  representing an undirected edge between  $u$  and  $v$ .

Your task is to determine the number of connected components in the graph using the Disjoint Set Union (DSU) data structure (also known as Union-Find). You can write the code/pseudocode/step-by-step instructions/flowchart to solve this problem.