

## BINUS University

<b>Academic Career:</b> <i>Undergraduate / <del>Master</del> / <del>Doctoral</del> *)</i>	<b>Class Program:</b> <i>International/Regular/Smart Program/Global-Class*)</i>				
<input checked="" type="checkbox"/> Mid Exam <input type="checkbox"/> Final Exam <input type="checkbox"/> Short Term Exam <input type="checkbox"/> Others Exam : _____	<b>Term : Odd/Even/Short *)</b>				
<input checked="" type="checkbox"/> Kemanggisan <input checked="" type="checkbox"/> Alam Sutera <input type="checkbox"/> Bekasi <input type="checkbox"/> Senayan <input type="checkbox"/> Bandung <input type="checkbox"/> Malang	<b>Academic Year :</b> <b>2021 / 2022</b>				
Faculty / Dept. : School of Computer Science	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 30%;">Deadline</td> <td>Day / Date : Wednesday / Dec 1<sup>st</sup>, 2021</td> </tr> <tr> <td></td> <td>Time : 13:00</td> </tr> </table>	Deadline	Day / Date : Wednesday / Dec 1 <sup>st</sup> , 2021		Time : 13:00
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	Time : 13:00				
Code - Course : COMP6049001 – Algorithm Design and Analysis	Class : All Classes				
Lecturer : Team	Exam Type : Online				
*) <i>Strikethrough the unnecessary items</i>					
<b><i>The penalty for CHEATING is DROP OUT!!!</i></b>					

### ***Learning Outcomes:***

**LO1:** Explain fundamental concept of analysis algorithms.

**LO2:** Apply algorithm techniques and methods.

**LO3:** Solve a problem using specific algorithm.

**LO4:** Compare several algorithm design methods.

### **Case (100 %)**

- [LO 1, LO 2, LO 3 & LO 4, 30 points]** From a list of network switches within a company and the length of wired network cable length from one network switch to another, find the minimum total cable length so that all network switches are connected and the list of the connections.

Sample input	Sample output
A B 11	33
A C 13	B-C 10
A D 15	A-B 11
B C 10	B-D 12
B D 12	
C D 14	

Output explanation: the total network length to connect A, B, C, D switches are 33 and the network connections are: B to C 10, A to B 11 and B to D 12

- Design** your algorithm in a pseudocode! (PS: use **greedy algorithm**)
- Do **analysis** for your algorithm resulting in an asymptotic notation (use **E** for the connections and **V** for the switch, e.g. **O(E x V)**, **O(E log V)**, **O(E x E)**, etc.)!
- Prove** that your algorithm is correct and create **your own Input / Output** with minimum of 6 switches and 12 network connections!

Verified by,

*Hidayaturrahman (D6423) and sent to Program on Nov 01, 2021*

2. [LO 1, LO 2, LO 3 & LO 4, 30 points] From a list of participants' ids, find which id is missing from the list. The participant ids sorted in ascending order with a certain difference.

Sample Input	Sample Output
120001 120013 120025 120037 120049 120061 120085 120097 120109 120121	120073

Output explanation: the difference for each id is 12, from the list the missing number is 120073 which is after **120061** and before **120085**.

- Design** your algorithm in a pseudocode with the complexity of  $O(\lg n)$ ! (PS: use **divide and conquer algorithm**)
  - Do **analysis** for your algorithm resulting in an asymptotic notation!
  - Prove** that your algorithm is correct and create **your own input / output** for **3 cases**, and minimum number of ids for each case is **15**!
3. [LO 1, LO 2, LO 3 & LO 4, 40 points] From a list of bid bonds, find out whether the bonds can be equally divided between 2 people with same value.

Sample Input 1	Sample Output 1
10022120 2343520822 428808992 2779943396 2408538	yes
Sample Input 2	Sample Output 2
44584242 2442877 28779743	no

Output explanation:

- Sample 1 **yes**: sum **2,782,351,934**, 1<sup>st</sup> person: {10022120, 2343520822, 428808992}, 2<sup>nd</sup> person: {2779943396, 2408538}
- Sample 2 **no**, there's no possibility to equally divide the bid bonds.

Questions:

- Design** your algorithm in a pseudocode! (PS: use **dynamic programming algorithm**)
- Do **analysis** for your algorithm resulting in an asymptotic notation! (PS: the bid bond value can be quite large in **trillion** ( $10^{12}$ ))
- Prove** that your algorithm is correct and create **your own input / output** for **4 cases**, and minimum number of bid bonds for each case is **20**!

-- Good Luck--

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