National University of Computer and Emerging Sciences, Lahore Campus

	Course:	**Applied Programming**	**Course Code:**	**CS-319**
	Program:	**MS (Computer Science)**	**Semester:**	**Fall 2017**
	Duration:	**60 Minutes**	**Total Marks:**	**50**
	Paper Date:	**20-Sep-17**	**Weight**	**15 %**
	Section:	**A and B**	**Page(s):**	**06**
	Exam:	**Midterm 1**	**Reg. No.**	

Instruction/Notes:

- Attempt all questions on this booklet
- If anything is unclear, make a reasonable assumption and mention it with the answer

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For instructor's use only:

Question #	Maximum marks	Obtained marks
1	15	
2	05	
3	10	
4	20	
Total	**50**	

Q. 1. Fill in the following table with the complexity in big-oh notation for the worst case:
[15 marks]

	Insert an element	Delete an element	Find an element	Find an element and move it to the beginning	Sort the elements in ascending order
Array					
Singly Linked List					
Doubly Linked List					

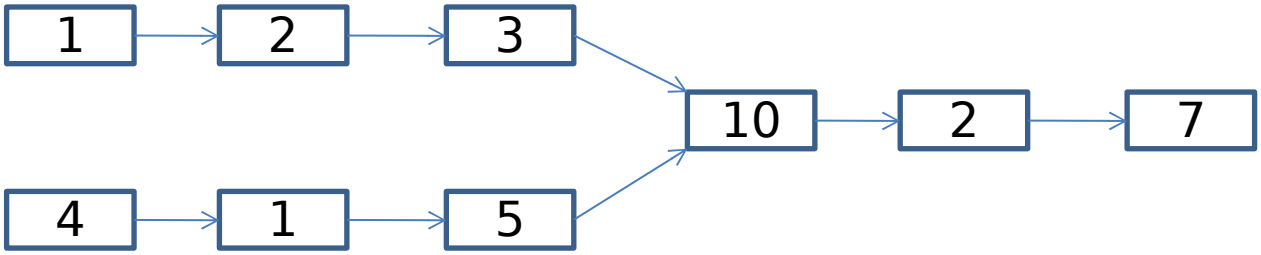
Q. 2. The worst case running time of algorithm A and B is O(n lg n) and $O(n^2)$, respectively. Is it possible that sometimes algorithm B runs faster than algorithm A? Provide reasoning.
[5 marks]

Q. 3. Prove the following using mathematical induction. [10 marks]

a) $\sum_{i=j}^{n} i = \frac{(n+1-j)(n+j)}{2}$

b) $\sum_{i=1}^{n} i^2 = \frac{n(n+1)(2n+1)}{6}$

Q. 4. You are given two linked lists with head pointers head1 and head2. The two linked lists merge at some point as shown in the following example. You need to write code that finds the merge point.



Complete the following starter code, adding functions as necessary so that the above requirements are met. [20 marks]

```
struct Node{
        int key;
        struct Node* next;
};
struct Node *head1, *head2;
```