

**Uva Wellassa University of Sri Lanka**  
**Faculty of Technological Studies**  
**Department of Information and Communication Technology**  
**Algorithm Design and Optimization (ICT 341-2)**  
**Assignment 01**

1 Hour and 30 minutes

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- (a) Define an algorithm. Explain what makes an algorithm efficient.
- (b) List and explain **four factors** that affect the running time of an algorithm.
- (c) Define **Big-O**,  **$\Omega$  (Omega)**, and  **$\Theta$  (Theta)** notations.
- (d) State one practical reason why Big-O notation is most commonly used in algorithm analysis.
- (e) Differentiate between internal sorting and external sorting with one example each.
- (f) What is an adaptive sorting algorithm? Name one adaptive and one non-adaptive sorting algorithm.
- (g) Sort the following array in ascending order using Bubble Sort. Show the result after each pass.

**Array: 25, 12, 9, 30, 18**

- (h) Write the worst-case, best-case, and average-case time complexities of Bubble Sort and Selection Sort.
- (i) Explain how Merge Sort follows the divide-and-conquer strategy.
- (j) Sort the following array using Quick Sort (take the last element as pivot). Show all partition steps.

**Array: 14, 7, 21, 10, 5**