

OBJECT ORIENTED PROGRAMMING I LABORATORY**Experiment # 10:****STL II****QUESTIONS**

1) Write a C++ program to use generate, equal, replace, accumulate, and find algorithms in the STL. Also, implement appropriate statements with selection (if) and repetition (for) to achieve the same purpose.

- i. Generate a random vector with 100 items.
- ii. Run STL algorithms for that vector and measure the elapsed time.
- iii. Run the codes that include if and for statements and measure the elapsed time.
- iv. Repeat ii and iii for 1000, 10000, 100000, 1000000, 1000000 items.
- v. Draw a chart to demonstrate the time performance of the algorithms depending on number of items.
- vi. Consider worst-case time complexities of the algorithms and discuss the results.

2) Write a C++ program to calculate evaluation metrics of classification problem such as precision, recall, and F1. Assume that we have 3 classes and 100 samples. First 40 samples belong to Class 1, last 10 samples belong to Class 3, and the remaining samples belong to Class 2.

- i. Define an integer vector for ground truth and initialize according to information given above.
- ii. Define an integer vector for results and initialize randomly in interval [1,3].
- iii. Find indices of samples for Class 1 in ground truth and assign the indices into an integer set.
- iv. Find indices of samples for Class 1 in results and assign the indices into an integer set.
- v. Determine True Positive (TP), False Positive (FP), and False Negative (FN) for the sets calculated in iii and iv.

$TP = r_i \cap gt_j$, where $r_i \in \text{result Indices}$ and $gt_j \in \text{ground truth Indices}$

$FP = r_i \setminus gt_j$, where $r_i \in \text{result Indices}$ and $gt_j \in \text{ground truth Indices}$

$TP = gt_j \setminus r_i$, where $r_i \in \text{result Indices}$ and $gt_j \in \text{ground truth Indices}$

- vi. Calculate precision, recall, and F1 for that class as follows:

$$\text{precision} = \frac{|TP|}{|TP| + |FP|}$$

$$\text{recall} = \frac{|TP|}{|TP| + |FN|}$$

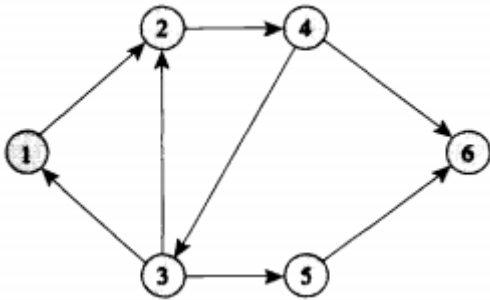
$$F1 = 2 \times \frac{\text{precision} \times \text{recall}}{\text{precision} + \text{recall}}$$

- vii. Repeat iii, iv, v, and vi for Class 2 and Class 3.

An example output for Class 1 is given below:

[illegible]

3) Assume that we have a topological map given below. In the map, the numbers in the circles describe the id of the node. Also each node has x and y coordinates given in the table. Use map to store node ids and x, y coordinates. Then, calculate the length of the path: 1-->2-->4-->6 by using the map.



IDs	Coordinates
1	(4.6,5.7)
2	(7.8,10.2)
3	(7.8,2.1)
4	(11.9,10.2)
5	(11.9,2.1)
6	(17.8,5.7)