

**COMPETITIVE PROGRAMMING**

**IET  
(INSTITUTE OF ENGINEERING  
AND TECHNOLOGY)**

**SUMMER MENTORSHIP PROGRAM**

**2018**

**REPORT**

**SAURABH SINGHAL(17CO240)**

# ACKNOWLEDGEMENT

The mentorship opportunity I had with IET(Institute of Engineering and Technology) club was a great chance for learning competitive programming. Therefore, I consider myself as a lucky individual as I was provided with an opportunity to be a part of it. I am also grateful for having a chance to meet so many wonderful seniors who led me through this mentorship period.

I express my deepest thanks to **Naveen Kumar** and **Abhishek Kamal** for their careful and precious guidance which were extremely valuable for my study both theoretically and practically. Hope to continue cooperation with all of you in the future.

SAURABH SINGHAL

17/07/2018

# **ABSTRACT**

This report describes the summer mentorship I joined at IET club in National Institute of Technology Karnataka. This mentorship report is based on my experience as a learner in the field of Competitive Programming. During my mentorship I participated in all the monthly contests organised at hackerrank. I also worked on weekly assignments given by mentors.

Overall, I am very satisfied with the results of my mentorship. I am able to use my knowledge and apply it to a competitive programming problems. I am able to use my knowledge and apply it in solving programming problems.

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# COMPETITIVE PROGRAMMING

Competitive programming is a mind sport usually held over the internet, involving participants trying to program according to provided specifications. Contestants are referred to as sport programmers. Competitive Programming is recognized and supported by several multinational software and internet companies such as google and facebook.

A programming competition generally involves the host presenting a set of logical or mathematical problems to the contestants, and contestants are required to write computer programs capable of solving each problem. Judging is based mostly upon number of problems solved and time spent for writing successful solutions.

The aim of competitive programming is to write source code of computer programs which are able to solve given problems. A vast majority of problems appearing in programming contests are mathematical or logical in nature. Typical such tasks belong to one of the following categories: combinatorics, number theory, graph theory, geometry, string analysis and data structures. Problems related to artificial intelligence are also popular in certain competitions.

## **OVERVIEW**

This Mentorship Program consisted of several sessions on

- 1:** Intro to C++ and STL, Time Complexity( Overview to Big-Oh Notations)
- 2:** Math and Implementation(Overview to Seive, Modulo Arithmetic and Chinese remainder theorem) and Linear Data-Structure(Stack and Queues)
- 3:** Greedy Algorithms and Bit Manipulation
- 4:** Dynamic Programing, Concept of Memoization and its Application.
- 5:** Graphs and Graph traversals(BFS and DFS) and its applications,Shortest path problem ,Trees and Heaps
- 6:** Segment Trees and Range Queries
- 7:** Sqrt Decomposition

All assignments that were given are:

Assignment 1:

<https://www.codechef.com/LTIME52/problems/C00K0FF/>  
<https://www.codechef.com/COOK85/problems/GAMSTICK/>

Assignment 2:

<https://www.hackerrank.com/contests/university-codesprint-3/challenges/bobs-game>

Assignment 3:

<http://www.codeforces.com/problemset/problem/983/A>  
<http://www.codeforces.com/problemset/problem/75/C>  
<http://codeforces.com/problemset/problem/687/B>

#### Assignment 4:

<https://www.codechef.com/JULY17/problems/IPCTRAIN>

Implement Binary search tree data structure having following functionalities.

- 1) Insertion of an element
- 2) Searching of an element
- 3) Printing all the element present using all the four traversal. Output should give all the four traversal order.

Implement Max heap or Min heap having following functionalities:

- 1) Insertion of an element along with proclain-up function to place that element at its correction position
- 2) Extract Min/Max and use heapify function to maintain the property of heap after removal of min/max.

#### Assignment 5:

<https://www.codechef.com/OCT17/problems/MARRAYS>

#### Assignment 6:

<https://www.codechef.com/ALMOCK01/problems/CHEFD>

<https://www.codechef.com/problems/ADDMUL>

Code:

Assignment 1 :

Question

1 : <https://www.codechef.com/COOK85/problems/GAMSTICK/>

Answer 1:

<https://www.codechef.com/submit/complete/19260343>

Question 2:

<https://www.codechef.com/LTIME52/problems/C00K0FF/>

Answer 2: [https://github.com/IET-NITK/CP-Summer-Mentorship-2018/blob/master/assignments/17CO240\\_saurabh/assignment1/q2.cpp](https://github.com/IET-NITK/CP-Summer-Mentorship-2018/blob/master/assignments/17CO240_saurabh/assignment1/q2.cpp)

Assignment 2:

Question : <https://www.hackerrank.com/contests/university-codesprint-3/challenges/bobs-game>

Answer : link not available

Assignment 3:

Question 1: <http://www.codeforces.com/problemset/problem/983/A>



Answer 1:[https://github.com/IET-NITK/CP-Summer-Mentorship-2018/blob/master/assignments/17CO240\\_saurabh/assignment3/qn1.cpp](https://github.com/IET-NITK/CP-Summer-Mentorship-2018/blob/master/assignments/17CO240_saurabh/assignment3/qn1.cpp)

Question 2:<http://www.codeforces.com/problemset/problem/75/C>

Answer 2:[https://github.com/IET-NITK/CP-Summer-Mentorship-2018/blob/master/assignments/17CO240\\_saurabh/assignment3/qn2.cpp](https://github.com/IET-NITK/CP-Summer-Mentorship-2018/blob/master/assignments/17CO240_saurabh/assignment3/qn2.cpp)

Question 3:<http://codeforces.com/problemset/problem/687/B>

Answer 3:[https://github.com/IET-NITK/CP-Summer-Mentorship-2018/blob/master/assignments/17CO240\\_saurabh/assignment3/qn3.cpp](https://github.com/IET-NITK/CP-Summer-Mentorship-2018/blob/master/assignments/17CO240_saurabh/assignment3/qn3.cpp)

Assignment 4:

Question 1:<https://www.codechef.com/problems/IPCTRAIN>

Answer 1:[https://github.com/IET-NITK/CP-Summer-Mentorship-2018/blob/master/assignments/17CO240\\_saurabh/assignment4/qn1.cpp](https://github.com/IET-NITK/CP-Summer-Mentorship-2018/blob/master/assignments/17CO240_saurabh/assignment4/qn1.cpp)

Question 2:[https://github.com/IET-NITK/CP-Summer-Mentorship-2018/blob/master/assignments/17CO240\\_saurabh/assignment4/qn2.cpp](https://github.com/IET-NITK/CP-Summer-Mentorship-2018/blob/master/assignments/17CO240_saurabh/assignment4/qn2.cpp)

Question 3:[https://github.com/IET-NITK/CP-Summer-Mentorship-2018/blob/master/assignments/17CO240\\_saurabh/assignment4/qn2.cpp](https://github.com/IET-NITK/CP-Summer-Mentorship-2018/blob/master/assignments/17CO240_saurabh/assignment4/qn2.cpp)

Assignment 5:

Question 1:<https://www.codechef.com/problems/MARRAYS>

Answer 1:[https://github.com/saurabh8522/CP-Summer-Mentorship-2018/tree/master/assignments/17CO240\\_saurabh\\_assignment5](https://github.com/saurabh8522/CP-Summer-Mentorship-2018/tree/master/assignments/17CO240_saurabh_assignment5)

Assignment 6:

Question

1:<https://www.codechef.com/ALMOCK01/problems/CHEFD>

Answer 1:<https://www.codechef.com/submit/complete/19260255>

Question 2:<https://www.codechef.com/problems/ADDMUL>

Answer 2:<https://www.codechef.com/viewsolution/19129019>

Contest 1:

Question 1 :<https://www.hackerrank.com/contests/cp-summer-mentorship-test-1/challenges/pop-count/submissions/code/1307870301>

Question 2:

<https://www.hackerrank.com/contests/cp-summer-mentorship-test-1/challenges/odd-even-saga-1/submissions/code/1307846856>

Question 3:

<https://www.hackerrank.com/contests/cp-summer-mentorship-test-1/challenges/summation-of-series/submissions/code/1307850507>

Question 4:

<https://www.hackerrank.com/contests/cp-summer-mentorship-test-1/challenges/van-helsing-snares-dracula-1/submissions/code/1307855784>

Question 5:

<https://www.hackerrank.com/contests/cp-summer-mentorship-test-1/challenges/shipment-of-toys/submissions/code/1307858357>

Question 6:

<https://www.hackerrank.com/contests/cp-summer-mentorship-test-1/challenges/good-knight/submissions/code/1307870719>

Question 7:

<https://www.hackerrank.com/contests/cp-summer-mentorship-test-1/challenges/fill-the-tank-1/submissions/code/1307870961>

Question 8:

<https://www.hackerrank.com/contests/cp-summer-mentorship-test-1/challenges/playing-with-numbers-5/submissions/code/1307870537>

Contest 2:

Question 1:

<https://www.hackerrank.com/contests/cp-summer-mentorship-test-2/challenges/munnivsbunny/submissions/code/1308738189>

Question 2:

<https://www.hackerrank.com/contests/cp-summer-mentorship-test-2/challenges/trip-to-bahamas/submissions/code/1308744292>

Question 3:

<https://www.hackerrank.com/contests/cp-summer-mentorship-test-2/challenges/am-i-special/submissions/code/1308743621>

Final Contest:

Question 1:

<https://www.hackerrank.com/contests/cp-summer-mentorship-final-contest/challenges/lesser-primes/submissions/code/1308919418>

Question 2:

<https://www.hackerrank.com/contests/cp-summer-mentorship-final-contest/challenges/bunny-loves-u/submissions/code/1308919927>

Question 4:

<https://www.hackerrank.com/contests/cp-summer-mentorship-final-contest/challenges/make-the-arrays-same/submissions/code/1308953651>

Question 6:

<https://www.hackerrank.com/contests/cp-summer-mentorship-final-contest/challenges/cyclic-array-problem/submissions/code/1308988245>

## FUTURE WORK

I have gained a valuable insight on my future career development through learning in mentorship started by IET club in NITK. I enjoyed learning in this club. I want to be recognised as someone who made positive difference in the lives of the people and I know that I will have to work hard to get the recognition. Upon completion, the first objective is to get a membership of club where I can learn as much as possible. I want exposure to a broad range of competitive areas where I can build a strong base of knowledge and experience.