

Analysis and Design of Algorithms
MINORI EXAMINATION - (Sem 1501)

Time: 1 hour

September 1, 2015

Marks: 21

Q1 (a) ✓ Suppose the input to a stack is 1 2 3 4 5 6 7 8. Find the number of possible permutations with the following characteristics: 4 5 * * * * 8, i.e. the first two numbers are 4 and 5 in that order, and the last number is 8.

(b) ✓ State and prove the necessary and sufficient condition that a permutation **cannot be generated** using a stack when the input is 1, 2, 3, .. n.

[4 + 3 = 7]

Q2. (a) Write a stable algorithm to sort an array of 10 lakh integer numbers in **decreasing** order where each number is between 0 and 100. Explain the significance of each step.

(b) ✓ In Merge3Sort technique, a variant of Merge Sort algorithm, one splits the input array into three parts, sort each of them using Merge3Sort, and then combine the three sorted arrays into one using a 3-way merging. Find the complexity of the algorithm. Justify your answer.

[4 + 3 = 7]

Q3. (a) ✓ Suppose three files are to be stored in a tape in a sequence. A tape device is such that after reading any file the tape rolls to the beginning of the tape. The lengths of the three files are 100, 200 and 300, respectively. If they are to be read 30, 10 and 20 times, respectively, then what will be your choice of ordering them on the tape? Justify your answer.

(b) ✓ Suppose $G = (V, E)$ is an undirected, weighted graph such that the weights of the edges are all distinct. Suppose C is any cycle in G . Let $e = (u, v)$ be the edge having maximum weight of all edges in C . Then prove that e cannot be part of any MST.

[3 + 4 = 7]