B.Sc. Engg. 8th Semester **09 November 2020**

ISLAMIC UNIVERSITY OF TECHNOLOGY (IUT)
ORGANISATION OF ISLAMIC COOPERATION (OIC)
Department of Computer Science and Engineering (CSE)

MID SEMESTER EXAMINATION **SUMMER SEMESTER, 2019-2020**

TIME: 1 Hour 30 Minutes **FULL MARKS: 50**

CSE 4809: Algorithm Engineering

Programmable calculators are not allowed. Do not write anything on the question paper.

There are **3 (three)** questions. Answer **all** of them. Figures in the right margin indicate marks.

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1. a) **(Write answers with *single sentence* only)** 1x5
   i. Why are asymptotic notations important?
   ii. How does divide and conquer help merge sort algorithm in sorting?
   iii. Why does quick sort algorithm just have division (i.e. partition) cost but does not have any merging cost?
   iv. What do you understand by polynomial time algorithm?
   v. Why are we not interested in exponential time algorithms for solving a problem?

   b) Write an algorithm to find the median of a data array in linear time. 6.66

   c) Find the solution to the resursion $T(n) = 6T(n/2) + n^2 \lg n$ using master methd. 5

2. a) **(Write answers with *single sentence* only)** 1x5
   i. What do you understand by 'decidability' of a problem?
   ii. Why do logic problems sometimes become un-decidable?
   iii. What is an approximation ratio of a suboptimal algorithm?
   iv. Define NP.
   v. Why is Turing famous for –solving halting problem or for Turing machine?

   b) Do the reductions in simple words (do not need equations or derivations): 2x3
   i. Reduce 'Hamiltonian cycle' finding problem to 'Cycle finding' problem in a graph.
   ii. Reduce 'Hamiltonian path' finding problem to 'longest simple path' finding problem.

   c) Describe how 2-SAT problem is solved. (i.e. when it is decidable and when it becomes undecidable). 5.66

3. a) **(Write answers with *single sentence* only)** 1x5
   i. How does dynamic programming save computation of a combinatorial optimization problem?
   ii. Every problem that has an optimal greedy algorithm should also have a dynamic programming solution- why or how?
   iii. Can dynamic programming algorithm be used in a path finding problem where the problem is to find the list of paths within a ratio of the optimal paths?
   iv. There can be some algorithm possible to devise for 3.iii). What will be complexitiy of such an algoirthm in general?
   v. Why do we use bottom up solution for a dynamic programming algorithm rather than using top- down approach?

   b) DTW algorithm can be used to solve LCS problem? Explain how. 6.66

   c) How does markovian propertiy helps to derive the optimal substructure equation of viterbi algorithm? 5