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B.Sc. Engg. CSE 8th Semester — 23 August 2019 (Morning)

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

MID SEMESTER EXAMINATION — **SUMMER SEMESTER, 2018-2019**

DURATION: 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 **4 (four)** questions. Answer any **3 (three)** of them including **Question 1 (mandatory)**.

Figures in the right margin indicate marks.

Mandatory

1. a) What is reducibility of a problem? Explain its usage in deciding tractability of a problem. 4
   b) Prove that circuit satisfyability problem is NP-hard. 8
   c) Given the recursion 8

$$T(n) = aT(n/b) + f(n), \quad a \geq 1, b > 1$$

Prove that if $f(n) = O(n^{\log_b^a - \varepsilon})$ for some constant $\varepsilon > 0$ then $T(n) = \Theta(n^{\log_b^a})$

2. a) Show the results of inserting the keys 8

F, S, Q, K, C, L, H, T, V, W, M, R, N, P, A, B, X, Y, D, Z, E

with minimum degree 3.

   b) Prove the correctness of Dijkstra's algorithm for finding single source shortest paths. 7

3. a) Write down the recursive equations for all-pair shortest path problems including the formulation given by Floyd-Warshall. 5
   b) Briefly explain the *path-relaxation* property for shortest path problems. 5
   c) Why does Bellman-Ford algorithm for negative weight cycle relax all the edges several times? How many times does the algorithm relax the edges? 5

4. a) Comment on the hardness of the problem of 'data mining'. 5
   b) What is Apriori property? Why does every data mining algorithm uses Apriori property? 5
   c) How does FP-Tree/ FP-Growth algorithm improve over Apriori algorithm for association pattern mining? 5