**CMPE 300 ANALYSIS OF ALGORITHMS** 5.1.2016

###### FINAL

1. Write in pseudocode a CRCW PRAM algorithm that finds the minimum element of a list L[1:n] *using less than n2 processors*. The algorithm will input L[1:n] and will output the minimum element. Your algorithm should be *as fast as possible*.

Explain which strategy the algorithm uses for concurrent writes; explain in detail that it is a proper strategy for this algorithm. Calculate W(n), S(n), C(n), and E(n) clearly. Is the algorithm cost optimal, cost efficient, time efficient?

1. A symmetric (square) matrix is a matrix in which entry (*i*,*j*) is equal to entry (*j*,*i*). That is, the upper-right triangle of the matrix is a mirror image of the lower-left triangle.

As we know, the lower bound of the problem of multiplying two arbitrary *n* x *n* matrices is Ω(n2). Is the lower bound of multiplying two symmetric *n* x *n* matrices also Ω(n2) or is it possible to multiply two symmetric matrices in o(n2) time? Answer this question using the *reduction (transformation) technique*.

*Hint*: Consider the *2n* x *2n* matrix $\left[\begin{matrix}0&A^{T}\\A&0\end{matrix}\right]$ or $\left[\begin{matrix}0&A\\A^{T}&0\end{matrix}\right]$ that can be formed from any matrix A, where AT stands for the transpose of A and 0 is the *n* x *n* zero matrix.

*Hint*: Consider matrix multiplication and square matrix multiplication as two different problems.

1. Design a *½-correct* (or better) *false-biased Monte Carlo algorithm* for testing whether AB=C, where A, B, and C are given *n* x *n* square matrices. The time complexity of the algorithm must be O(n2). Explain your results (why your algorithm is O(n2), why it is false-biased, and why it is ½-correct).

(*Note:* Do not write pseudocode, but explain the algorithm step by step.)

*Hint:* Consider an argument similar to testing equality in polinomials. Use a vector. Consider multiplying matrix/matrices with a vector.

*Notes:*

* Where pseudocode is required, the syntax of the pseudocode must be strictly followed. No points will be given if the syntax is not followed or any other language (e.g. C) is used.
* Questions 1:30 points; 2,3:35 points
* Time: 1:30 hours
* Close notes and books

*(continued on next page)*

Biz ki boş yere gerilmişiz anladık artık,

Yıldızların amansız çarkına

Ve boş yere sızlamış kemiklerimiz,

Bilmiyoruz şimdi, mevsim yaz mı, bahar mı

Bahçelerde hâlâ güller açar mı,

Bilmiyoruz, kadınlar, kızlar,

Şarkılar masallar var mı?

Gece ile gündüz,

Acıdan kaskatı kesilmiş yüz,

Uykusuzluktan harap göz,

Öpüşen dudaklar,

Çözülmeye razı olmayan eller var mı?

Ayrılık var mı gurbet var mı?

Biz beyhude yere gecikenler,

Çoktan bitmiş bir yolun ucunda

Bilmiyoruz şimdi ıssız gecede

Ne yapar ne eder,

Gidip de gelmeyenler,

Beyhude bekleyenler!

Biz ayın çıplak arsasında

Savrulan zaman kırıntıları,

Nerden bilelim bunları