

COMP 9601 Theory of Computation and Algorithms Design

Assignment 4

Due on Dec 2, 2015

Each question carries 25 points. Answer 4 questions (the fifth lowest score will be discarded if all questions are answered). Please make your answers **precise and concise**.

1. Show that MARK is H_k -competitive if all requests are in the range $[1..k + 1]$, where k is the size of the cache.
2. Show that for any request sequence I , $LRU_{2k}(I) \leq 2Opt_k(I) + a$, where LRU_{2k} denotes the cost incurred by LRU with respect to a cache of size $2k$, $Opt_k(I)$ is the optimal cost for serving I with respect to a cache of size k , and a is a constant.
3. Show that FIFO (first in first out) is k -competitive, where k is the size of the cache.
4. Suppose we modify the EDF algorithm discussed in the class in such a way EDF will not schedule a job after its deadline. Show that with respect to this version of EDF, it is no longer true that at any time, the total work scheduled by EDF is no less than that of the optimal offline algorithm. Nevertheless, prove that this version of EDF is still optimal of hard deadline scheduling.
5. Consider flow time scheduling on two processors. Give a sequence of jobs to show that SRPT is not 4.5-competitive for total flow time.