Advanced Algorithms
Spring 2021
IIIT Hyderabad

Homework 5, Due: Friday April 16, 2021

Problem 1. Consider the load balancing algorithm studied in class. Find an input for the greedy assignment algorithm that has an approximation ratio as close to 2 as possible. Your answer should be generic in the sense that the answer extends to any number of machines instead of a fixed number of machines. **(3 Points)**

Problem 2. Repeat Problem I for the sorted greedy assignment algorithm and see if there are inputs that push the approximation ratio as close to 3/2 as possible. **(3 Points)**

Problem 3. Consider the algorithm for obtaining a fractional independent set in planar graphs. Given a constant c, find a graph class that has a fractional independent set of size at least n/c.

1. $c = 1/3$

2. $c = 1/2$

Note that the answer above need not correspond to the ability of a parallel algorithm to obtain such a large independent set.
(2 Points)

Problem 4. Reconsider the definition of a fractional independent set. For any given constant c, will there exist graph classes such that they have an independent set of size at least n/c. **(3 Points)**