CS 537 Scheduling Algorithms
Homework #1
(Due: 4/30/2013)

Note: Turn in your homework with a cover sheet including your name and last 4 digits of your
student ID # so that your grade can be correctly recorded. Write on only one side of each page.

(Total: 100 points)

1. (20 points) Give a full description of the scheduling problems denoted by the
following α | β | γ notation shown below.

(a) R3 | rj, intree | Σ Uj
(b) Q | prmp, dj | Σ Cj
(c) Pm | Pj = 1, chains | Cmax
(d) 1 | prec | ΣWj Cj

1. (20 points) Give the computational complexity of the following scheduling problems
— NP-hard or polynomially solvable or OPEN?

(a) P3 || Cmax
(b) P2 | Pj = 1, chains | Cmax
(c) 1 | prec | Cmax
(d) P4 | Pj = 1, prec | Cmax
(e) P7 | Pj = 1, intree | Cmax

3. (20 points) Show that

(a) P3 || Cmax is NP-hard by showing the decision version of P3 || Cmax is NP-complete.
(Hint: Use PARTITION as the source problem in the reduction.)
(b) Pm || Cmax is NP-hard for fixed m > 3 by showing the decision version of Pm || Cmax is NP-complete. (Hint: Also use PARTITION as the source problem in the reduction. Generalize the reduction given in part (a).)
4. (20 points) Use Hu’s algorithm to construct a schedule for the following jobs on 4 identical and parallel machines. Each job has a processing time of 1 unit.

5. (20 points) Use Coffman-Graham algorithm to construct a schedule for the following jobs on 2 identical and parallel machines. Each job has a processing time of 1 unit.