CSC256 Final Exam Cheatsheet

Summary of Schedulability Analysis Algorithms

	Fixed-Priority Scheduling		Dynamic Priority Scheduling	
Optimal Scheduling Algorithm	Rate Monotonic (RM) Scheduling for implicit deadline taskset (D=T)	Deadline Monotonic (DM) Scheduling for constrained deadline taskset (D≤T)	Earliest Deadline First (EDF) Scheduling for implicit deadline taskset (D=T)	Earliest Deadline First (EDF) Scheduling for constrained deadline taskset (D≤T)
Schedulability Analysis Algorithm	Utilization Bound (UB) test $U = \sum_{i=1}^{N} \frac{C_i}{T_i} \leq N(2^{1/N} - 1)$ (sufficient but not necessary condition) or Response Time Analysis (RTA) (necessary and sufficient) $R_i = C_i + \sum_{\forall j \in hp(i)} \left\lceil \frac{R_i}{T_j} \right\rceil C_j \leq D_i$	RTA Response Time Analysis (RTA) (necessary and sufficient) $R_i = C_i + \sum_{\forall j \in hp(i)} \left\lceil \frac{R_i}{T_j} \right\rceil C_j \leq D_i$	Utilization Bound (UB) test $U = \sum_{i=1}^{N} \frac{C_i}{T_i} \leq 1$ (necessary and sufficient)	Density Bound test $\Delta = \sum_i \frac{C_i}{\min(D_i, T_i)} \leq 1$ (sufficient but not necessary condition) or Demand Bound Function (not covered)

PCP Blocking Time

A given task i is blocked (or delayed) by at most one critical section of any lower priority task locking a semaphore with priority ceiling greater than or equal to the priority of task i. We can explain that mathematically using the notation:

$$B_i = \max_{\{k,s \,\mid\, k \in lp(i) \,\wedge\, s \in used\_by(k) \,\wedge\, ceil(s) \geq pri(i)\}} cs_{k,s} \qquad (4.5)$$

Consider all lower-priority tasks (k∈lp(i)), and the semaphores they can lock (s)
Select from those semaphores (s) with ceiling higher than or equal to 〖$pri(i)=P$〗 _i
Take max length of all tasks (k)’s critical sections that lock semaphores (s)