EC 633, Queueing Systems
Home Assignment No. 6

Date/Place of Submission: Lecture of 12-OCT-2009 (*In view of our past experience, your TAs will collect your home assignments from you as you enter the lecture.*)

1. For the n-priority Non-Preemptive M/G/1 queue, show that

$$\sum_{k=1}^{n} \rho_k W_{qk} = \frac{R\rho}{(1-\rho)}$$

where, W_{qk} is the mean waiting time in queue for a customer of priority class *k* and $\rho_k (= \lambda_k \overline{X_k})$ is the offered traffic of class *k*.

2. Consider a 2-priority preemptive resume priority M/G/1 queue with high priority customers of class 2 and lower priority customers of class 1. The system enforces the rule that there can be only one class 2 customer in the system at any time but allows infinite buffering for class 1. Let X_i i=1, 2 be the **fixed** service times (*not random!*) for class *i*. Arrival processes are Poisson with rates λ_1 and λ_2 for classes 1 and 2, respectively.
For this queue, consider a class 1 customer who starts service at time *t* and leaves the system at time *t*+*T* after obtaining the required service. What would be the distribution of the random variable *T* (or its transform)?

3. Using standard notation, analyze the M/G/1/1 queue following the procedure given in the lecture to obtain the probability of blocking and the probability that the queue is empty.