EE 679, Queueing Systems (2000-01F)
Test -5, November 6, 2000

Max. Marks = 25 **Time = 60 minutes**
Attempt all three problems

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1. Students enter the mess for breakfast in *equally likely* groups of either one or two with a group arrival rate of l. The first member of the group is served in an exponentially distributed time X with pdf $b(t)$ and LST $\tilde{B}(s)$. The second member (if any) orders an extra omelet which requires D seconds more where D is fixed. The mess operates as a *Single-Server* $M^{[X]}/G/1$ queue.

Find the mean delay that an arriving student will encounter before being served. *[10]*

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 (i.e. there is no buffering for Class 2) - however, there is *infinite buffering* for Class 1 customers. Let X_2 *(FIXED)* be the service time for Class 2 and X_1 *(FIXED)* be the service time for Class 1. Arrival processes are Poisson with average arrival rate l_1 for Class 1 and l_2 for Class 2.

For this, consider a Class 1 customer who start service at time t and leaves the system at time $t+T$. What would be the distribution (or L.S.T.) of the random variable T? [*Hint:* You can assume a Poisson distribution at the appropriate place without explicitly deriving it.] *[10]*

3. Consider the system of Problem 2 once again except that we now assume that Class 2 customers can also be infinitely buffered. For this obtain the average total delays encountered by Class 2 and Class 1 customers. *[5]*