EE 679, Queueing Systems (2001-02F)
Test -4, October 17, 2001

Max. Marks = 25 **Time = 60 minutes**
Attempt both problems

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1. Consider a M/G/1 queue with *exceptional first service* where arrivals come at the mean rate l. A normal service time is of duration X (random variable) with mean and second moment of $\overline{X}$ and $\overline{X^2}$, respectively. The *exceptional first service* starting each busy period is of duration $X+D$ where the random variable D has the mean and second moments $\overline{\Delta}$ and $\overline{\Delta^2}$, respectively. The random variables X and D are independent of each other.

Using the Residual Life approach, obtain the following for this queue.

(a) The probability that the server is idle [3]

(b) The mean time W spent in system by an arrival. [6]

2. Consider an unusual M/G/1 queue where the normal service is the random variable X with pdf, cdf and L.T. of pdf given by $b(t)$, $B(t)$ and $\tilde{B}(s)$. *This is the kind of service given to jobs in the queue in* ***all situations except*** *when the number of jobs in the system at the instant service starts* is *one*. When that is the case, the service time is an exceptional one of duration X^* with pdf, cdf and L.T. of pdf given by $b^*(t)$, $B^*(t)$ and $\tilde{B}^*(s)$. The mean arrival rate of jobs to the queue is given by l.

For this queue, find the following

(a) The probability p_0 that the system is empty [8]

(b) The probability p_1 that there is one job in the system [8]