EE 679, Queueing Systems (2001-02F)
Test -5, November 9, 2001

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

[*Note that you can leave expressions without simplifying them if all the terms have been defined/obtained earlier. You are also allowed to use standard results as mentioned in this context in class.*]

1. Consider a $M^{[X]}/G/1$ queue where the batches arrive at rate l from a Poisson process. Assume that the batch size distribution is *geometric* with the probability distribution given by *P{batch size =r}=(1-q)q*$^{r-1}$ for *r=1,............, ¥*.

If the service time distribution for a job has moments $\overline{X}$ and $\overline{X^2}$, obtain the mean queueing delay for a job in terms of these moments and *q*. [10]

2. Consider the same $M^{[X]}/G/1$ queue as in Problem 1, except that the first customer in a batch requires an *additional* service time of *D* (fixed). Note that this additional service time is over and above the normal service time *X*, with moments as defined in Problem 1. The batch size distribution is also still geometric with *P{batch size =r}=(1-q)q*$^{r-1}$ for *r=1,............, ¥*.

Obtain the mean queueing delay for a job for this case. [10]

3. For a n-priority Non-preemptive M/G/1 queue show that -

$$\sum_{k=1}^{n} r_k W_{q(k)} = \frac{Rr}{(1-r)}$$

where $W_{q(k)}$, R and r have their standard definitions. [5]