EE 679, Queueing Systems (2000-01F)
Test -1, Aug 18, 2000

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

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1. A system is put into operation at time t=0. Its time of failure is a random variable X with cdf $F_X(x)$ and pdf $f_X(x)$. Let $\beta(t)dt$ be the probability that it will fail in (t,t+dt) given that it has not failed until time t.

(a) Find $f_X(x)$ if we are given that $\beta(t)=kt$. *[5]*

(b) If X is uniformly distributed in the interval (0,T), then what would be $\beta(t)$ in this interval. *[5]*

2. The instructor for EE679, keeps the door of the lecture hall L-5 open for a random time interval Y before his lecture where the pdf, cdf and L.S.T of Y are given as $f_Y(y)$, $F_Y(y)$ and $\tilde{F}_Y(s)$, respectively. Students arrive from a Poisson Process with rate λ and can enter L-5 only while the door is open. Let N be the (random) number of students attending the lecture (i.e. those who can enter!).

(a) Find the *Generating Function* $G_N(z)$ of the number of students N attending the EE679 lecture. *[5]*

(b) Find the first and seconds moments of N, in terms of the moments of Y using (a) *[5]*

(c) If $f_Y(y)$ is exponentially distributed with mean $1/m$, find the distribution of N using $G_N(z)$ from (a). *[5]*