Homework Set No. 1

ECE 642
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Problem 1

Show that the Binomial distribution has:

a) Moment generating function $G_x(z) = (q + pz)^n$

b) $E(X) = np$

c) $\sigma_x^2 = npq$

Problem 2

Show that if arrival of messages is Poisson, then interarrival time is exponentially distributed; i.e., given interarrival time $= T$, show

$$f_T(\tau) = \lambda e^{-\lambda \tau}$$

for $\tau \geq 0$.

Problem 3

Show that z is a Poisson random variable with mean $(\lambda_1 + \lambda_2)$, if $z = x + y$ where x,y are independent Poisson random variables with $x : \lambda_1$ and $y : \lambda_2$.

Problem 4

Find the distribution of z where $z = x + y$ and x,y are independent with:

$$x : N(\mu_1, \sigma_1^2)$$

$$y : N(\mu_2, \sigma_2^2)$$