American University of Beirut

STAT 230

Introduction to Probability and Random Variables

Spring 2007

quiz # 2

Name: .... ID #: ....

1. *(10 points)* A purchaser of electrical components buys them in lots of size 10. It is his policy to inspect 3 components randomly from a lot and accept the lot only if all 3 are non defective. If 30 percent of the lots have 4 defective components and 70 percent have only 1, what proportion of lots does the purchaser reject?

2. *(5 points)* If X has a Poisson distribution so that $3P(X = 1) = P(X = 2)$, find $P(X = 4)$.

3. *(15 points)* Let X be a random variable with with pdf

$$f(x) = (1/2)x^2e^{-x}\,, \quad 0 < x < \infty$$

Find the mgf of X. Find $E(X)$ and $Var(X)$.

4. *(5 points)* A random variable Y has a Binomial distribution with mean 6 and variance 3.6. Find $P(Y = 4)$.

5. *(10 points)* If independent trials, each resulting in a success with probability 2/3, are performed, find the probability of 8 successes occurring before 5 failures.

6. *(15 points)* A salesman has scheduled two appointments to sell encyclopedias. His first appointment will lead to a sale with probability 0.3, and his second will lead independently to a sale with probability 0.6. Any sale made is equally likely to be either for the deluxe model, which costs \$1000, or the standard model, which costs \$500. Determine the pdf of the random variable X, the total dollar value of all sales. Find his expected daily sales.

7. *(15 points)* A hospital obtains 40% of its flu vaccine from company A, 50% from company B, and 10% from company C. From past experience it is known that 3% of the vials from A are ineffective 2% from B are ineffective, and 5% from C are ineffective. The hospital tests five vials from each shipment. If at leat one of the five vials is ineffective, fins the conditional probability of that shipment coming from company C.

8. *(5 points)*If $E(X^n) = 5^n, n = 1, 2, 3, \ldots$, find $M(t)$, the moment generating function of X, and find the pdf of X.

9. *(10 points)* The probability that a machine produces a defective item is 0.01. Each item is checked as it is produced. Assume these are independent trials and compute the probability that at most 100 items must be checked to find one that is defective.

10. *(10 points)* let X be a random variable with pdf

$$P(X = k) = \frac{1}{(k + 1)(k + 2)}\,, k = 0, 1, 2, \ldots$$

Find the conditional probability of $X \geq 4$, given that $X \geq 1$.