MATH 323 TEST II

1. A continuous random variable X has probability density function f given by

$$f(x) = \begin{cases} \frac{x}{16} & \text{for } 2 \le x \le 6 \\ \text{zero elsewhere} \end{cases} .$$

Then $P[\ 3 \le X \le 5\ ] =$

a. $\frac{1}{2}$ b. $\frac{1}{8}$ c. $\frac{1}{4}$ d. $\frac{5}{32}$ e. $\frac{5}{16}$

2. If M(t) is the moment-generating function for X, the moment-generating function for Y = 2 X – 3 is

a. $e^{-3t}\, M(2t)$ b. $e^{3t}\, M(2t)$ c. $e^{-2t}\, M(3t)$

d. $2M(t) - 3$ e. $e^{-3t}\, M(t)$

3. The probability-generating function P(t) for a binomial random variable of 37 trials with p = 0.6 is

a. $(0.6t + 0.4)^{37}$ b. $(0.4t + 0.6)^{37}$ c. $0.6t^{37} + 4$

d. $\frac{1}{38}\ t^{38}\ (.6) + 0.4t$ e. $\binom{37}{y}\ (.6)^{ty}\ (.4)^{37-ty}$

4.

x	P(x)
0	0.3
1	0.1
–1	0.2
2	0.4

A random variable X has probability distribution shown in the table at the left. It is easily seen that E (X) = 0.7. The standard deviation of X is

a. 1.19 b. 1.10 c. 1.12 d. 1.22 e. 1.27

5. Thirty percent of magnetrons obtained from a manufacturer are defective. Let Y denote the number of non-defective magnetrons in a shipment of 25. The probability $P[13 \leq Y \leq 17]$ is

a. 0.471 b. 0.488 c. 0.405 d. 0.411 e. 0.439

6. Let Y be a binomial random variable with parameters n = 6 and p = $\frac{1}{3}$. The probability P (Y= E(Y)) , that Y equals its expected value, is

a. 0.3292 b. 0.3071 c. o.3498 d. 0.3854 e. 0.3987

7. A shipment of 100 lenses arrives at an optical shop. It is known that on the average 6% of these lenses will have scratches on them. The probability that 30 lenses must be examined before 4 scratched lenses will be found is

a. $\binom{29}{3}(.06)^4(.94)^{26}$ b. $\binom{30}{3}(.06)^4(.94)^{26}$ c. $\binom{30}{4}(.06)^4(.94)^{26}$

d. $\binom{29}{3}(.06)^3\ (.94)^{27}$ e. $\binom{29}{4}(.06)^4\ (.94)^{26}$

8. A random variable X has a Poisson distribution with mean $\lambda = 8$. The value of $E(X^2)$ is

a. 72 b. 8 c. 16 d. 64 e. 32

9. According to an advertisement by a coffee company 70% of all coffee drinkers prefer their brand. The probability that the third person interviewed is such a coffee drinker is

a. 0.063 b. 0.082 c. 0.115 d. 0.052 e. 0.077

10. A probability generating function for a random variable Y is given by

$$P(t) = \frac{1}{2}\left(5 + t + 2t^2 + 3t^3 + t^4 \right)$$

The value of $E\left(Y\left(Y - 1\right)\right)$ is

a. 17 b. 19 c. 16 d. 20 e. 15

11. Let X be a random variable with $E(X) = \mu$ and standard deviation σ. If $P\left[\, |X - \mu| < k\sigma \,\right] \geq \frac{16}{25}$ then the smallest value of k is

a. $\frac{5}{3}$ b. $\frac{1}{2}$ c. $\frac{4}{3}$ d. $\frac{5}{4}$ e. $\frac{7}{3}$

12. Let X be a random variable with $\mu = 73$ and $\sigma = 8$. Using Tchebysheff's theorem find the largest value for Z such that

$$P\ [\ 57 < x < 89\ ]\ \geq Z$$

a. 0.75 b. 0.80 c. 0.65 d. 0.85 e. 0.77

13. Find which one of the following functions cannot be a probability density function no matter what value the constant k is given. These functions have value zero except where defined below.

a. $k\, x^{-\frac{3}{2}}$; $0 < x \leq 1$

b. $k\, |\sin x|$; $-\pi \leq x \leq \pi/2$

c. $k\, e^x$; $0 \leq x \leq 10$

d. $k\, x^{-\frac{3}{2}}$; $1 \leq x < \infty$

e. $k\, e^{-x}\ |\sin x|$; $0 \leq x < \infty$

14. An average of 12 people per hour come to the emergency room of a hospital during the hours from 9:00 p.m. to 5:00 a.m. Let Y denote the number of people that come between 1:00 a.m. and 2:00 a.m. Find the probability $P[8 \leq Y \leq 11]$.

a. 0.372 b. 0.462 c. 0.576 d. 0.155 e. 0.242

15. In problem 14 find the probability that thirteen people come between 1:00 a.m. and 2:00 a.m.

a. 0.106 b. 0 c. 0.115 d. 0.098 e. 0.003

16. A sack contains 9 oranges 4 of which are blemished. A sample of three oranges is selected at random. Let Y denote the number of blemished oranges in the sample. Find $P[y = 1]$

a. 0.476 b. 0.513 c. 0.0476 d. 0.0794 e. 0.402

17. A continuous random variable X has probability density function f(x) given by

$$f(x) = \begin{cases} \frac{x}{2} & 0 \le x \le 1 \\ \frac{1}{4} & 1 < x \le 4 \end{cases}$$

The expected value E (X) is

a. 2.04 b. 1.98 c. 2.81 d. 3.41 e. 3.07