MAT 2377
Mi-term I

Monday October 3 2016   **Professor M. Alvo**

Time: 70 minutes

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This is an open book test. Standard calculators are permitted. Answer all questions. **Place your answers in the table below and remit the entire exam.**

Question	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Answer	D	A	C	A	B	B	E	E	C	D	D	A	E	C

1. A , B are two events such that $P(A) = .5$, $P(B) = .3$ and $P(A \cap B) = .2$ what is $P(A' \cap B)$?

(A) .6   (B) .8   (C) 0.15   (D)* .1   (E) .9

2. A box contains two 25-watt, three 40-watt and four 100-watt bulbs. In how many ways can three bulbs be selected from the box in sampling without replacement?

(A)* $\frac{9!}{3!6!}$ (B) $9\,(8)\,(7)$ (C) $3\,(2)\,(1)$ (D) $\frac{9!}{2!3!4!}$

(E) $25\,(40)\,(100)$

3. A competitor to Apple ships its cell phones in lots of 20. Suppose 60% of all such lots contain no defective phones, 30% contain one defective phone and 10% contain two defective phones. In a sample inspection, a lot is picked at random and two phones are selected at random from that lot and tested. Given that neither is defective, what is the probability that two defective exist in the lot?

(A) 0.90   (B) 0.10   (C)* 0.0847   (D) 0.2841   (E) 0.6312

4. Let X be a discrete random variable having density $f(x) = \frac{1}{4}, x = 2, 4, 8, 16$. Calculate the mean $E[X]$.

(A)* $\frac{15}{2}$ (B) 10   (C) 30   (D) 2   (E) 2.5

5. Let X, Y be two random variables having joint density

$$f(x, y) = \begin{cases} \frac{2}{3}(x + 2y) & 0 \leq x \leq 1, 0 \leq y \leq 1 \\ 0 & elsewhere \end{cases}$$

What is the marginal density of X?

(A) $f_X(x) = \frac{1}{3}(4x + 1), 0 \leq x \leq 1$ (B)* $f_X(x) = \frac{2}{3}(x + 1), 0 \leq x \leq 1$
(C) $f_X(x) = \frac{2}{3}(x + 2), 0 \leq x \leq 1$ (D) $f_X(x) = \frac{1}{3}(x + 1), 0 \leq x \leq 1$
(E) $f_X(x) = \frac{4}{3}(x + 1), 0 \leq x \leq 1$

6. A salesman can call at 16 homes in one morning. If the probability of his making a sale is 0.1 at each home and these events are independent, what the probability that he makes at least one sale that morning?
(A) $(.1)^{16}$ (B)* $1 - (.9)^{16}$ (C) $1 - (.1)^{16}$ (D) $(.9)^{16}$ (E) 0

7. A continuous random variable X has density

$$\begin{aligned} f_X(x) &= 2(1-x), 0 < x < 1 \\ &= 0, otherwise. \end{aligned}$$

What is the variance of X?.

(A) $1/20$ (B) 0.368 (C) 1   (D) 0   (E)* $\frac{1}{18}$

8. The probabilities that a service station will pump gas into 0,1,2,3,4,5 or more cars during a 30-minute interval are 0.03, 0.18, 0.24, 0.28, 0.10, and 0.17 respectively. Find the probability that in this 30-minute interval at most 4 cars receive gas.

(A) 0.10 (B) 0.73 (C) 0.27 (D) 0.17 (E)* 0.83

9. A discrete random variable X has the following cumulative mass function:

$$F(t) = \begin{cases} 0 & t < 0 \\ \frac{1}{20} & 0 \le t < 1 \\ \frac{5}{20} & 1 \le t < 2 \\ \frac{10}{20} & 2 \le t < 3 \\ \frac{15}{20} & 3 \le t < 4 \\ 1 & 4 \le t \end{cases}$$

Calculate the conditional probability $P(X > 3 | X > 2)$.

(A) $\frac{1}{20}$ (B) $\frac{1}{4}$ (C)* $\frac{1}{2}$ (D) $\frac{2}{3}$ (E) $\frac{3}{4}$

10. Let X, Y be independent random variables such that $E(X) = 1, E(Y) = 2, \sigma_X^2 = 3, \sigma_Y^2 = 4.$

Calculate $Var[(2X + 3Y)]$.
(A) 13   (B) $\frac{13}{5}$ (C)5   (D)* 48   (E) 11

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11. The density of a discrete random variable X is given by

x	0	1	2	3	
$f(x)$	$\frac{1}{3}$	$\frac{1}{2}$	0	$\frac{1}{6}$	

Calculate $E(X-2)^2$

(A) 4   (B) 12   (C) 1   (D)* 2   (E) $\frac{1}{3}$

12. A candy maker produces mints with mean weight 20 gms and standard deviation 0.4 gm. Suppose 25 mints are selected at random. What is the mean weight and standard deviation of their sum?(the answers exhibit mean, standard deviation)

(A)* $500, 2$ (B) $20, 2$ (C) $500, 4$ (D) $20, 4$ (E) $500, 0.4$

13. Let X, Y be the number of hand produced bicycles by two workers A, B respectively in a single day. The joint density is given below. Compute $P(X < Y)$.

x\y	0	1	2	3
0	0.00	0.05	0.10	0.10
1	0.05	0.10	0.10	0.10
2	0.10	0.10	0.10	0.10

(A) 0.30   (B) 0.45   (C) 0.35   (D) 0.20   (E)* 0.55

14. Let X, Y be two independent random variables each with density

$$f(x) = \begin{cases} 2x, & 0 < x < 1 \\ 0 & elsewhere \end{cases}$$

Calculate $P(X < 0.5, Y < 0.5)$

(A) 0.5   (B) 0.10   (C)* 0.25^2 (D) 0.25^4 (E) 0.25