بسم الله الرحمن الرحيم

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STAT 324
Second Mid-term Examination
First Semester
1429 – 1430 H

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- Mobile Telephones are not allowed in the classrooms.
- Time allowed is **90 minutes**.
- Answer all questions.
- Choose the nearest number to your answer.
- WARNING: Do not copy answers from your neighbors. They have different questions forms.
- For each question, put the code of the correct answer in the following table beneath the question number:

1	2	3	4	5	6	7	8	9	10

11	12	13	14	15	16	17	18	19	20

21	22	23	24	25	26	27	28	29	30

Answer the following questions

Question No. 1.

The cumulative distribution of a discrete random variable X, is given below:

$$F(x) = \begin{cases} 0 & \text{for } x < 1 \\ \frac{1}{4} & \text{for } 1 \leq x < 3 \\ \frac{1}{2} & \text{for } 3 \leq x < 5 \\ \frac{3}{4} & \text{for } 5 \leq x < 7 \\ 1 & \text{for } x \geq 7 \end{cases}$$

(1) The $P(X = 5)$ equals:

(A) 0.5
(B) **0.25**
(C) 0.75
(D) 0.0

(2). $P(X > 3)$ equals:

(A) **0.5**
(B) 0.25
(C) 1
(D) 0.75

(3). $P(1.4 < X < 6)$ equals:

(A) 0.25
(B) **0.50**
(C) 0.30
(D) 0.0

Question No. 2.

The life of a certain tire brand lives is a random variable X that follows the exponential distribution with a mean of 2 years.

(4). For $x > 0$, the cumulative distribution function (CDF) for the random variable X is:

(A) e^{-2}
(B) $1 - e^{-2}$
(C) e^{-x}
(D) $1 - e^{-\frac{x}{2}}$

(5). The probability that a tire of this brand will live less than 1.5 years is:

(A) 0.9534
(B) 0.3935
(C) 0.6065
(D) **0.5276**

(6). The probability that a tire of this brand will live at least 3 years is:

(A) 0.6358
(B) **0.2231**
(C) 0.4905
(D) 0.3679

Question No. 3.

Let X represents the outcome when a balanced die is tossed.

(7). The mean of $g(X) = 3X^2 + 4$ is

(A) 45.5
(B) 14.5
(C) **49.5**
(D) 12.5.

(8). The variance of X is:

(A) 3.641
(B) **2.916**
(C) 5.751
(D) 6.254

(9). The variance of $g(X) = 3X^2 + 4$ is:

(A) 36.64
(B) **1342.25**
(C) 2275
(D) 254.3.

(10). According to Chebyshev's theorem, for any random variable X with mean μ and variance σ^2, a lower bound for $P(\mu - 2\sigma < X < \mu + 2\sigma)$ is:

(A) 0.267
(B) 0.3175
(C) **0.750**
(D) 0.250

Question No. 4.

Let X be a continuous random variable with the probability density function

$$f(x) = \frac{3}{2}x^2, \quad \text{for } -1 < x < 1.$$

(11). $P(0 < X < 1) = ...$

(A) **0.5**
(B) 0.3
(C) 0.7
(D) 0.2

(12). $E(X) = ...$

(A) 0.9
(B) **0.0**
(C) 0.8
(D) 0.1

(13). $Var(X) = ...$

(A) 0.12
(B) **<u>0.60</u>**
(C) 0.40
(D) 0.18

<u>Question No. 5.</u>

Suppose that the percentage of females in a certain population is 50%. A random sample of 3 people is selected from this population. Let X be the number of females in the sample.

(14). The probability that no females are selected is:

(A) 0.375
(B) 0.112
(C) 0.240
(D) **<u>0.125</u>**

(15). The probability that at most two females are selected is:

(A) 0.624
(B) 0.245
(C) **<u>0.875</u>**
(D) 0.821

(16). The expected number of females in the sample is:

(A) **<u>1.5</u>**
(B) 2.3
(C) 5.8
(D) 0.0

(17). The variance of the number of females in the sample is:

(A) **<u>0.75</u>**
(B) 0.30
(C) 2.1
(D) 3.25

<u>Question No. 6.</u>

Lots of 40 components each are called acceptable if they contain no more than 3 defectives. The procedure for sampling the lot is to select 5 components at random (without replacement) and to reject the lot if a defective is found. If there are 3 defectives in the entire lot:

(18). the probability that exactly one defective is found in the sample equals:

(A) 0.1103
(B) **0.3011**
(C) 0.1013
(D) 0.3110

(19). the expected value (mean) of the number of defectives in the sample equals:

(A) **0.375**
(B) 0.213
(C) 0.821
(D) 0.735

(20). the variance of the number of defectives in the sample equals:

(A) 0.113298
(B) **0.311298**
(C) 0.251471
(D) 0.174251

Question No. 7.

Suppose that the number of traffic violation tickets issued by a policeman has a Poisson distribution with an average of 2.5 tickets per day.

(21). The average number of tickets issued by this policeman for a period of two days is:

(A) 2.00
(B) 1.25
(C) 2.50
(D) **5.00**

(22). The probability that this policeman will issue 2 tickets in a period of two days is:

(A) 0.1404
(B) 0.2565
(C) **<u>0.0842</u>**
(D) 0.1755

<u>Question No. 8.</u>

In a photographic process, the developing time of prints may be considered as a random variable having the normal distribution with a mean of 16.28 second and a standard deviation of 0.12 second. Then, the probability that the developing time to develop one of the prints will be:

(23). anywhere from 16 to 16.5 seconds equals:

(A) 0.0435
(B) 0.1762
(C) **<u>0.9565</u>**
(D) 0.2018

(24). at least 16.20 seconds equals:

(A) **<u>0.7454</u>**
(B) 0.34221
(C) 0.6502
(D) 0.2514

(25). at most 16.35 second equals:

(A) 0.3101
(B) **<u>0.7190</u>**
(C) 0.2810
(D) 0.4053

<u>Question No. 9.</u>

The average life of a certain battery is 5 years, with a standard deviation of 1 year. Assume that the life of the battery approximately follows a normal distribution.

(26). The *sample mean* of a random sample of 5 batteries selected from this product has a mean [i.e $E(\overline{X})$], equal to:

(A) 0.2
(B) **<u>5</u>**
(C) 3
(D) 1

(27). The *variance* of the *sample mean* [i.e $Var(\overline{X})$] of 5 batteries selected from this product is equal to:

(A) **<u>0.2</u>**
(B) 5
(C) 3
(D) 1

(28). The probability that the average life of a random sample of size 16 of such batteries will be less than 5.5 years, is:

(A) 0.9223
(B) 0.0228
(C) **<u>0.9772</u>**
(D) 0.5321

(29). The probability that the average life of a random sample of size 16 of such batteries will be more than 4.75 years is:

(A) 0.8103
(B) 0.1587
(C) 0.9452
(D) **<u>0.8413</u>**

(30). If $P(\overline{X} > a)$ =0.1492 where $\overline{X}$ represents the sample mean for a random sample of **<u>size 9</u>** of such batteries, then the numerical value of the constant a is:

(A) 4.6532
(B) 6.510
(C) **<u>5.3466</u>**
(D) 2.8713

Good Luck.