Unity University Adama Campus

Computer Science Department

Introduction to Statistics (STAT 2091) Group Assignment I (from 15%)

Submition deadline: *until March 20, 2023*

1. Marks of 50 students out of 35 are summarized in the following frequency distribution.

Marks	Number of students
0 – 5	5
6 – 11	8
12 – 17	f_3
18 - 23	12
24 – 29	f_5
30 – 35	7

If 20% of the students have marks 12 - 17, find the missing frequencies f_3 & f_5. **[1pt]**

2. Let k denote the standard deviation for a sample of 25 numbers. **[2pts]**

(a) If each number is multiplied by 10, what is the standard deviation of the new set of numbers, as a function of k?

(b) Is the coefficient of variation affected by this multiplication? Explain.

3. Use the data in Q1 after replacing the value of the missed frequencies, find the followings: **[3pts]**

(a) The mean and median of the distribution.

(b) $Q_3, D_7, P_{35}, and\ P_5$

(c) Mean Deviation about the Mean, Variance and Standard Deviation

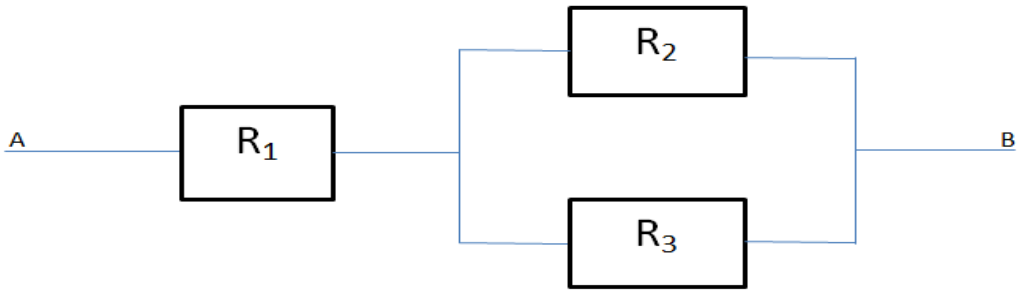
4. The median and the mode of a mesokurtic distribution are 32 and 34 respectively. The 4th moment about the mean is 243. Compute the Pearson coefficient of skewness and identify the type of skewness. Assume (n-1 = n). **[1pt]**

5. In a college football training session, the defensive coordinator needs to have 10 players standing in a row. Among these 10 players, there are 1 freshman, 2 sophomores, 4 juniors, and 3 seniors. How many different ways can they be arranged in a row if only their class level will be distinguished? **[1pt]**

6. If the probabilities that a software engineer will service 3, 4, 5, 6, 7, or 8 or more computerized machines on any given workday are, respectively, 0.12, 0.19, 0.28, 0.24, 0.10, and 0.07, what is the probability that he will service at least 5 machines on his next day at work? **[1pt]**

7. A company owns two factories that produce similar items. Factory-1 produces 1000 items, 100 of which are defective and factory-2 produces 4000 items, 200 of which are defective. An item is chosen at random from the production of the company and found to be defective. What is the probability it came from factory-1? **[1pt]**

8. An assembly of electronic equipment consists of 3 components arranged in a series-parallel circuit as follows



Each component is either operative or fails under load. The entire assembly fails only if the path from A to B is broken. Let the sample space S consist of the eight possible combinations of operative or inoperative components. Let E_1 be the event 'the assembly is operative'; let E_2 be the events '**R_2** has failed but the assembly is operative'; let E_3 be the event '**R_3** has failed but the assembly is operative'. **[4pts]**

(a) List the sample points of S, E_1, E_2 and E_3.

(b) Investigate whether E_1, E_2 and E_3 are mutually exclusive or not.

(c) It is clear that the system works if component R_1 works and either of the components R_2 or R_3 works. The reliability (probability of working) of each component i.e., $P(R_1)= 0.9$, $P(R_2)= 0.8$, and $P(R_3)= 0.8$, Find the probability that

i. The entire system works and

ii. The component R_2 does not work, given that the entire system works. Assume that the three components work independently.

9. A shipment of 20 similar laptop computers to a retail outlet contains 3 that are defective. If a College makes a random purchase of 2 of these computers, construct the probability distribution for the number of defectives. **[1pt]**

10. In a digital communication channel, assume that the number of bits received in error can be modeled by a binomial random variable, and assume that the probability that a bit is received in error is $1*10^{-5}$. If 16 million bits are transmitted, what is the probability that more than 150 errors occur? **[1pt]**