KING FAHD UNIVERSITY OF PETROLEUM & MINERALS
DEPARTMENT OF MATHEMATICS & STATISTICS
DHAHRAN, SAUDI ARABIA

STAT 319: Probability & Statistics for Engineers & Scientists
Term 181, Second Major Exam
Monday November 26, 2018 (5:15 pm)

Please circle your instructor's name:

Abbas Anabosi Riaz Saleh

Name:_____ ID#:_____

Section#:_____ Class Time: _____ Serial#:_____

Instructions:

1. Formula sheet will be provided to you in exam. You are not allowed to bring with you, any formula sheet or other printed/written paper.
2. Mobiles are not allowed in exam. If you have your mobile with you, turn it off and keep it under your seat so that it is visible to proctor.
3. Show all your work. **No points for answer without justification**.
4. Round up to 4 decimal points if needed.
5. Make sure you have 8 unique pages of exam paper (including this title page).

Question No	Full Marks	Marks Obtained
1	**12**	
2	**14**	
3	**12**	
4	**13**	
5	**09**	
Total	**60**	

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Q.No.1: - (4+4+4 = 12 pts.) Suppose a certain mechanical component produced by a company has a width that is normally distributed with a mean 2600 and a variance 0.16.

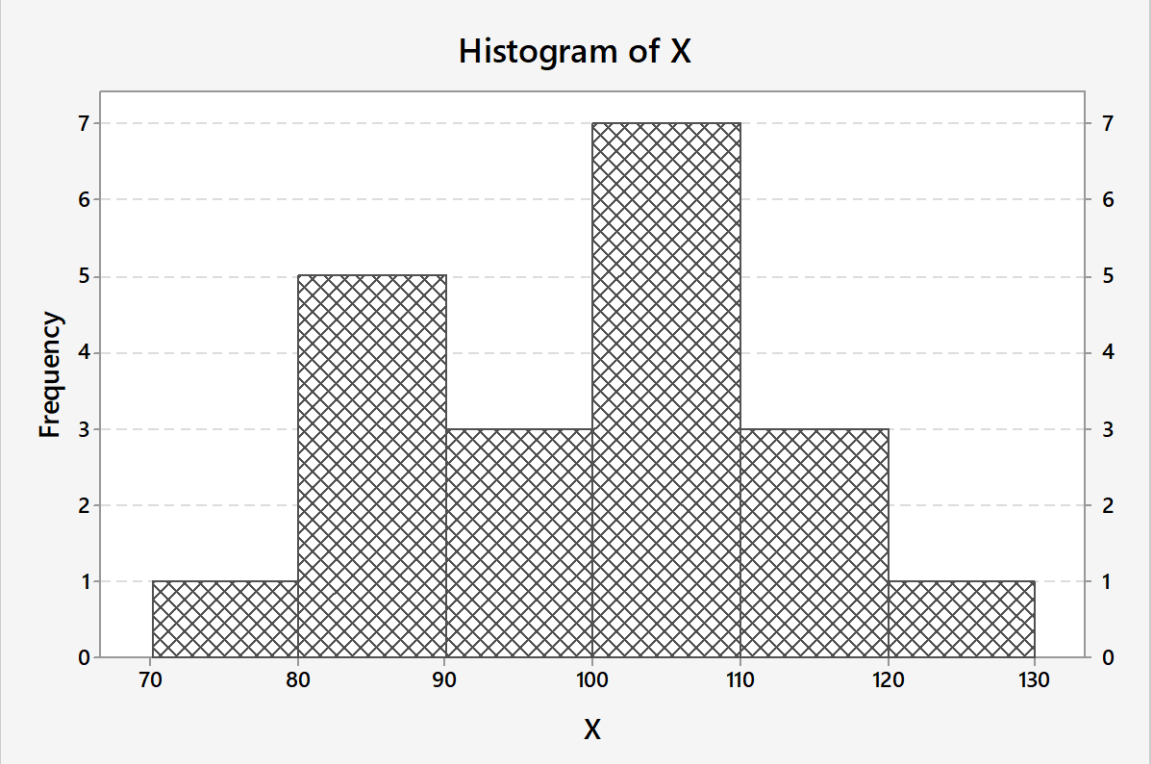
(a) What proportion of the components have a width outside the range 2599 to 2601?

(b) In an assembly procedure, four of these components need to be fitted side by side into a slot. Suppose that the slot has a width of 10402.2. What is the probability that four randomly selected components will be able to fit into the slot?

(c) If the company needs to be able to guarantee to its purchaser that no more than 1 in 500 of the components have a width less than 2599, by how much does the value of σ need to be reduced?

Q.No.2: - (6+8 = 14 pts.)

(a) The histogram of a numerical variable (X) is shown below:



(i) (1 pt.) How many values of X are less than 100?

(ii) (1 pt.) Exactly 14 observations are greater than or equal to what value of X?

(iii) (4 pts.) Approximate the mean and standard deviation of X.

(b) Compute the following using the stem and leaf plot of a discrete random variable (Y):

```
Stem-and-leaf of Y
Leaf Unit = 1.0

frequency      stem      leaf
 1              0         6
 3              1         13
 5              2         89
(4)             3         0478
 3              4
 3              5         05
 1              6         4
```

(2 pt.) Median

(1 pt.) Mode

(3 pts.) Interquartile range

(2 pts.) 60^{th} percentile of Y

Q.No.3: - (5+7 = 12 pts.)

(a) The pH levels of a random sample of 16 chemical mixtures from a process were measured and a sample standard deviation $s = 0.42$ were obtained. Assuming the normality of pH level, the scientists presented a confidence interval $(6.469, 7.253)$ for the average pH level of chemical mixtures from the process. What is the confidence level of this confidence interval?

(b) A chemical plant is required to maintain ambient sulfur levels in the working environment atmosphere at an average level of no more than 12.50. The results of 15 randomly timed measurements of the sulfur level produced a mean of 14.82 and a standard deviation of 2.91. What is the evidence that the chemical plant is in violation of the working code? **Use p-value approach.**

H_0: _____ H_1: _____

Test Statistic:

p-value:

Decision and Conclusion:

Q.No.4: - (4+6+3 = 13 pts.) In a particular day, 22 out of 543 visitors to a website followed a link provided by one of the advertisers.

(a) Construct and interpret a 92% confidence interval for the percentage of website user who follow a link provided by an advertiser.

Interpretation:

:

(b) The owner of the website suspects that the percentage of visitors who follow the link provided by one of the advertisers is less than 5%. **Assume the probability of Type-I error to be 0.1 and use critical value approach.**

H_0: _____ H_1: _____

Test Statistic:

Decision Rule and Critical Value:

Decision and Conclusion:

(c) If this percentage of website user who follow a link provided by an advertiser is required to be known to a precision of ±1%, how many additional visitors need to be selected?

Q.No.5: - (4+5 = 9 pts.)

(a) Suppose that a help session for a course has a capacity of 650 students, but that invitations are sent out to 4600 students. If each student who receives an invitation has a probability of 0.13 of attending the help session, independently of everybody else, what is the probability that the number of students attending the help session will exceed the capacity?

(b) Bricks' weights are independently distributed as a normal distribution with mean 110 ounces and standard deviation 2 ounces. What is the smallest value of n such that there is a probability of at least 99% that the average weight of n randomly selected bricks is between 109 and 111?