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

STAT 319: Probability & Statistics for Engineers & Scientists
Semester 163, Second Major Exam
Tuesday August 08, 2017. 7:00 pm

Please circle your instructor's name:

Abbas Marwan 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, formula sheet or any other printed/written paper.
2. Mobiles are not allowed in exam. If you have your mobile with you, turn it off and put 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 09 unique pages of exam paper (including this title page).

Question No	Full Marks	Marks Obtained
1	**16**	
2	**07**	
3	**23**	
4	**10**	
5	**07**	
Total	**63**	

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Read all the instructions carefully (mentioned on first page) before starting exam.

Q.No.1: - (4+4+8 = 16 points)

(a) The manager of a small postal substation is trying to quantify the variation in the weekly demand for mailing tubes. The manager decided to assume that this demand is normally distributed with an average of 100 tubes purchased weekly. Also he found that 90 percent of the time, the weekly demand is below 115. Find the standard deviation of this distribution.

(b) The managers of an electronics firm estimate that 70% of the new products they market will be successful. If the company markets 8000 products over the next five years, approximate the probability of at most 2349 unsuccessful products?

(c) Suppose that the length of stay (X) in hours at an emergency department is modeled with a lognormal random variable with $\theta = 1.5$ and $\omega = 0.31$. Determine the following:

(i) $P(X < 10 \mid X > 7)$

(ii) The first quartile of the random variable X.

Q.No.2: - (3+4 = 7 points)

The average lifetime of a light bulb is 3000 hours with a standard deviation of 696 hours. A simple random sample of 36 bulbs is taken from this population.

(a) What is the probability that the average lifetime in the sample will be equal to or greater than 3219.24 hours?

(b) Find the 80th percentile of the sampling distribution of the sample mean $\overline{X}$.

Q.No.3: - (4+4+3+6+6 = 23 points)

An article in the Transactions of the Institution of Chemical Engineers (1956, 34, 280-293) reported data from an experiment investigating the effect of several process variables on the vapor phase oxidation of naphthalene. A sample of percentage mole conversion of naphthalene to maleic anhydride follows:

2.5	2.9	3	3.2	3.7	3.9	4	4.3
4.4	4.7	4.9	5	5	5.1	5.4	5.4
5.6	6	6	6.1	6.25	6.5	6.7	7
7.7							

$\sum X = 125.25$, $\sum X^2 = 672.1425$

(a) Estimate the population mean, median and the standard deviation.

Mean:

Standard Deviation:

Median:

(b) Use the sample results to develop a 93% confidence interval estimate for the population mean.

(c) Using the confidence interval calculated in part (b), test the claim that the average percentage mole conversion of naphthalene to maleic anhydride is not 5. Clearly specify the null and alternative hypotheses.

H_0: **H_1:**

Decision Rule, Decision and Conclusion:

(d) Check the presence of any suspected outlier(s) in the sample data. Use the sample quartiles.

Lower Quartile:	**Upper Quartile:**
Interquartile Range:	
Check for presence of Outliers:	

(e) Dose this sample satisfy the empirical rule? Explain.

Q.No.4: - (3+7 = 10 points)

(a) The diameter of holes for a cable harness is known to have a normal distribution with $\sigma = 0.025$ cm. Suppose that we wanted the error in estimating the mean hole diameter to be within ±0.005 cm at 95% confidence level. What sample size should be used?

(b) The diameter of holes for a cable harness is known to have a normal distribution with $\sigma = 0.025$ cm. A random sample of size 10 yields average diameter of 3.75 cm. If the manufacturer of such cable harness claims that the average diameter of the hole is less than 3.77 cm. Use the *p-value* to test the manufacturer's claim. Clearly state your hypotheses, test statistics, *p-value* and your final conclusions. Use $\alpha = 0.10$.

H_0: **H_1:**

Test Statistic:

***p-value* and Decision Rule:**

Decision and Conclusion:

Q.No.5: - (7 points)

A study on the heights of Engineering students at KFUPM is conducted. A sample of 35 students is selected and their heights (in inches) are as follows:

65.18	65.56	65.80	65.80	65.97	66.65	66.89
66.91	66.97	66.98	67.05	67.11	67.13	67.72
67.90	68.14	68.14	68.34	68.34	68.41	68.52
68.53	68.54	68.78	68.95	69.15	69.43	69.61
69.91	70.19	70.23	70.30	70.33	70.63	70.84

Ali believes that the proportion of Engineering students at KFUPM having height more than 67 inches is 0.70. Test Ali's claim using the critical region approach.

Clearly state your hypotheses, test statistics, critical values and final conclusions. Use 4% level of significance to test the hypothesis (using critical-value approach).

H_0: **H_1:**

Test Statistic:

Critical Value and Decision Rule:

Decision and Conclusion: