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

STAT 319: Probability & Statistics for Engineers & Scientists
Semester 142
Third Major Exam
Monday May 04, 2015
6:30 – 8:00 pm

Please circle your instructor name:

Abbas   Al-Sawi   Malik

       Riaz   Saleh   Samuh

Name: ID #:   Section #:   Serial #:

Question No	Full Marks	Marks Obtained
1	**31**	
2	**10**	
3	**08**	
4	**08**	
Total	**57**	

Q.No.1:- (3+4+4+4+3+5+5+3 = 31 marks) The diameter of steel rods (measured in inches) manufactured on two different extrusion machines is being investigated. Two random samples of sizes n_1 and n_2 are selected. The sample information for the two machines in the form of sample sizes, means and variances are given as:

Machine 1: $n_1 =30,\ \bar{x}_1 = 8.73,\quad s_1^2 = 0.35$

Machine 2: $n_2 = 10\,, \bar{x}_2 = 8.68,\quad s_2^2 = 0.40.$

Use this sample information to answer the following questions.

a. Point estimate
   i)   for the mean diameter of steel rods produced by machine 1: _____

   ii)   for the mean diameter of steel rods produced by machine 2: _____

   iii)   for the difference in mean rod diameters: _____

b. Standard error
   i)   for the mean diameter of steel rods produced by machine 1: _____

   ii)   for the mean diameter of steel rods produced by machine 2: _____

   iii)   for the difference in mean rod diameters: _____

   iv)   Pooled estimate of standard deviation for the diameters
           of steel rods produced by machines 1 and 2:   _____

c. Test the hypothesis that the mean diameter of steel rods produced by machine 1 is not 8 inches. Use table value (critical value) approach at type I error rate of 0.04.

    d. Construct a 98% confidence interval for the mean diameter of steel rods produced by machine 2. Interpret the interval and also, write down the assumptions we need to construct the interval.

    e. How large a sample is needed if we wish to be 95% confident that the sample mean diameter of steel rods produced by machine 1 will be within 2 inches of the true mean?

f. Is there evidence to support the claim that the mean diameters of two machines differ by at most 0.10 inches? Use p value approach to make your decision at 1% level of significance.

g. Construct a 99% confidence interval for the difference in mean rod diameters produced by two machines (assuming the equality of population variances). Use this interval to test the hypothesis of no difference in mean rod diameters.

   h. What assumption(s) did you need in solving the problem in parts (f) and (g)?

Q.No.2:- (5+5 = 10 marks) It is believed that more than 60% of the residents in a certain area favor an annexation suit by a neighboring city.

   a. What conclusion would you draw if only 110 in a sample of 200 voters favor the suit? Use a 0.05 level of significance. (Write the null and the alternative hypotheses, test statistics, decision rule, critical values, then write your conclusion.)

b. How large a sample is needed if we wish to be 98% confident that our sample proportion will be within 0.05 of the true proportion of the residents favoring an annexation suit by a neighboring city, and we do not have a prior estimate of the proportion?

Q.No.3:- (3+5 = 8 marks) Based on random sample of size 11 from a normal population with known σ, one has calculated the 95% confidence interval for the population mean and obtained the result $(60.5 , 85.6)$. Using this result, find

a. a point estimate of the population mean μ.

b. a 99% confidence interval for μ.

Q.No.4:- (6+2 = 8 marks) An automobile insurance company selected random samples of 300 single male policyholders and 300 married male policyholders. The resulting data were that 19% of the single policyholders and 12% of the married ones had reported an accident at some time within the past 3 years.

a. Estimate the true difference between the two population proportions in these two types of policyholders using 99.5% confidence interval. Would you agree with the claim that there is a different in these two types of policyholders?

b. Check the assumptions, you needed in solving the problem in part (a)?