**EASTERN MEDITERRANEAN UNIVERSITY**

 **Department of Industrial Engineering**

**IENG584 Advanced Quality Engineering**

**HOMEWORK 1 Spring 2018-19**

1. The content of liquid detergent bottles is being analyzed, Twelve bottles, randomly selected from the process, are measured, and the results are as follows (in fluid ounces):

 16.05, 16.03, 16.02, 16.04, 16.05, 16.01, 16.02, 16.02, 16.03, 16.01, 16.00, 16.07

(a) Calculate the sample average.

(b) Calculate the sample standard deviation.

(c) Construct a box plot for the above data.

1. An important quality characteristic of water is the concentration of suspended solid material (in ppm). Following table contains 40 measurements on suspended solids for a certain lake. Construct a normal probability plot.



1. A random sample of 50 units is drawn from a production process every half hour. The fraction of nonconforming product manufactured is 0.02. What is the probability that *p*ˆ ≤ 0.04 if the fraction nonconforming really is 0.02?
2. A sample of 100 units is selected from a production process that is 1% nonconforming. What is the probability that *p*ˆ will exceed the true fraction non- conforming by *k* standard deviations, where *k* = 1, 2, and 3?
3. Glass bottles are formed by pouring molten glass into a mold. The molten glass is prepared in a furnace lined with firebrick. As the firebrick wears, small pieces of brick are mixed into the molten glass and finally appear as defects (called “stones”) in the bottle. If we can assume that stones occur randomly at the rate of 0.00001 per bottle, what is the probability that a bottle selected at random will contain at least one such defect?
4. If *x* is normally distributed with mean and standard deviation four, and given that the probability that *x* is less than 32 is 0.0228, find the value of µ.
5. The life of an automotive battery is normally distributed with mean 900 days and standard deviation 35 days. What fraction of these batteries would be expected to survive beyond 1,000 days?
6. A lightbulb has a normally distributed light outputwith mean 5,000 end foot-candles and standard deviation of 50 end foot-candles. Find a lower specification limit such that only 0.5% of the bulbs will not exceed this limit.
7. The inside diameters of bearings used in an aircraft landing gear assembly are known to have a standard

deviation of A cm random sample of 15 bearings has an average inside diameter of 8.2535 cm.

(a) Test the hypothesis that the mean inside bearing diameter is 8.25 cm. Use a two-sided alternative and 

(b) Construct a 95% two-sided confidence interval on mean bearing diameter.

10) The service life of a battery used in a cardiac pacemaker is assumed to be normally distributed. A random sample of 10 batteries is subjected to an accelerated life test by running them continuously at an elevated temperature until failure, and the following lifetimes (in hours) are obtained: 25.5, 26.1, 26.8, 23.2, 24.2, 28.4, 25.0, 27.8, 27.3, and 25.7.

(a) The manufacturer wants to be certain that the mean battery life exceeds 25 h. What conclusions can be drawn from these data (use )

(b) Construct a 90% two-sided confidence interval on mean life in the accelerated test.

(c) Construct a normal probability plot of the battery life data. What conclusions can you draw?