

# Unit 6 - Week 4

**Course outline**

How does an NPTEL online course work?

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## Assignment 4

The due date for submitting this assignment has passed. Due on 2020-02-26, 23:59 IST.  
 As per our records you have not submitted this assignment.

1) The weight of an electronic component is normally distributed with a mean of 6 ounces and a standard deviation of 0.25 ounce. 5 points

(a) Find the probability that the electronic component weighs more than 6.5 ounces.  
 (b) What must the standard deviation of weight be in order for the company to state that 99% of its electronic components are less than 6.5 ounces?  
 (c) If the standard deviation stays at 0.25 ounce, what must the mean weight be in order for the company to state that 99.9% of its electronic components are less than 6.5 ounces?

a. 0.02275, 0.1418, 4.7275  
 b. 0.01275, 0.1618, 4.7275  
 c. 0.02275, 0.1618, 5.7275  
 d. 0.02275, 0.1418, 5.7275

a.  
 b.  
 c.  
 d.

No, the answer is incorrect. Score: 0  
 Accepted Answers: c.

2) A manager uses Rules 1 and 2 for determining out-of-control conditions for a process. The manager constructs 3σ limits. 5 points

(i) What is the overall Type-I error probability assuming independence of the rules?  
 (ii) What is the probability of Type-II error assuming the process mean is now at 100 mm (having moved from 90 mm) and that the process standard deviation is 5 mm. Samples of size 5 are selected from the process.

a. 0.0014, 0.07215  
 b. 0.0041, 0.01527  
 c. 0.0041, 0.07215  
 d. 0.0014, 0.01527

a.  
 b.  
 c.  
 d.

No, the answer is incorrect. Score: 0  
 Accepted Answers: c.

3) The diameter of a metal shaft for a precision instrument is assumed to be normally distributed with a mean of 0.5 mm and a standard deviation of 0.025 mm. 5 points

(a) What is the probability that a shaft diameter is greater than 0.31 mm?  
 (b) What is the probability that a shaft diameter is between 0.235 and 0.315 mm?

a. 0.00135, 0.62109  
 b. 0.00235, 0.72109  
 c. 0.00335, 0.62109  
 d. 0.00135, 0.72109

a.  
 b.  
 c.  
 d.

No, the answer is incorrect. Score: 0  
 Accepted Answers: d.

4) A major automobile company is interested in reducing the time that customers have to wait while having their car serviced with one of the dealers. They select four customers randomly each day and find the total time that each customer has to wait (in minutes) while their car is serviced. From these four observations, the sample average and range are found. This process is repeated for 25 days. The summary data for these observations are  $\sum_{i=1}^{25} \bar{X}_i = 1000$ ,  $\sum_{i=1}^{25} R_i = 250$  5 points

(i) Find the  $\bar{X}$  and R-chart control limits  
 (ii) Assuming the process to be in control and distribution of waiting time is normal, find the percentage of customers who will not have to wait more than 50 min.

a. (22.82, 0), (47.29, 32.71), 0.8803  
 b. (12.82, 0), (37.29, 22.71), 0.9803  
 c. (12.82, 0), (37.29, 32.71), 0.7803  
 d. (22.82, 0), (47.29, 32.71), 0.9803

a.  
 b.  
 c.  
 d.

No, the answer is incorrect. Score: 0  
 Accepted Answers: d.

5) Control charts for  $\bar{X}$  and R are kept on the tensile strength (in kg/cm<sup>2</sup>) of steel beams. The sample size is 5. After 30 samples, the summary information is  $\sum_{i=1}^{30} \bar{X}_i = 7518$ ,  $\sum_{i=1}^{30} R_i = 375$  5 points

The specifications are 250±10kg/cm<sup>2</sup>

(iii) Find the  $\bar{X}$  and R-chart control limits  
 (iv) Assuming the process to be in control, estimate the process standard deviation.  
 (v) If the company wants to make sure that the output tensile strength of the product is not less than 265 kg/cm<sup>2</sup>, what proportion of the output will not meet this criterion?

a. (250.8125, 233.3875), (29.425, 0), 5.374, 0.0045  
 b. (257.8125, 243.3875), (29.425, 0), 3.374, 0.0045  
 c. (250.8125, 233.3875), (26.425, 0), 3.374, 0.0037  
 d. (257.8125, 243.3875), (26.425, 0), 5.374, 0.0037

a.  
 b.  
 c.  
 d.

No, the answer is incorrect. Score: 0  
 Accepted Answers: d.

6) In a gasoline-blending plant, the quality of the output as indicated by its octane rating is measured for a sample taken from each batch. The observations from 20 such samples are shown in the table below. Construct a chart for the moving range of two successive observations and a chart for individuals 5 points

Sample	Octane Rating	Sample	Octane Rating	Sample	Octane Rating	Sample	Octane Rating
1	89.2	6	87.5	11	85.4	16	90.3
2	86.5	7	92.6	12	91.6	17	85.6
3	88.4	8	87	13	87.7	18	90.9
4	91.8	9	89.8	14	85	19	82.1
5	90.3	10	92.2	15	91.5	20	85.8

(i) Find out the centre line, UCL and LCL of the moving range control chart based on two successive observations  
 (ii) Find out the centre line, UCL and LCL of the control chart for individual values

a. (2.105, 13.41,0) (78.56, 99.48, 77.64)  
 b. (3.105, 13.41,0) (88.56, 99.48, 87.64)  
 c. (4.105, 12.41,0) (88.56, 99.48, 77.64)  
 d. (4.105, 13.41,0) (88.56, 99.48, 77.64)

a.  
 b.  
 c.  
 d.

No, the answer is incorrect. Score: 0  
 Accepted Answers: d.

7) The number of nonconforming microchips obtained from 20 random samples is shown in table below. The corresponding sample size is also indicated. Construct a p-chart with control limits for each sample. Which sample is out of control and what is the fraction of nonconformity? 5 points

Sample	Inspected microchips	Nonconforming microchips	Sample	Inspected microchips	Nonconforming microchips
1	50	4	11	80	6
2	90	6	12	120	8
3	100	8	13	100	20
4	90	7	14	80	5
5	80	8	15	110	8
6	40	4	16	40	6
7	50	6	17	40	4
8	50	5	18	50	7
9	110	8	19	120	5
10	70	6	20	50	4

a. 15, 0.020  
 b. 13, 0.020  
 c. 13, 0.20  
 d. 15, 0.20

a.  
 b.  
 c.  
 d.

No, the answer is incorrect. Score: 0  
 Accepted Answers: c.

8) The number of nonconforming door hinges as found for samples of size 300 is shown in the table below. Construct a chart for the number of nonconforming hinges. What control limits would you use for the next period, assuming that special causes for the out-of-control points are identified? 5 points

Sample	Non-conforming hinges	Sample	Non-conforming hinges	Sample	Non-conforming hinges
1	10	11	10	21	9
2	14	12	6	22	7
3	12	13	12	23	12
4	6	14	7	24	6
5	11	15	20	25	8
6	14	16	8	26	6
7	8	17	10	27	9
8	9	18	7	28	10
9	7	19	12	29	7
10	25	20	13	30	12

a. 0.618, 19.182  
 b. 0.429, 19.182  
 c. 0.618, 18.675  
 d. 0.429, 18.675

a.  
 b.  
 c.  
 d.

No, the answer is incorrect. Score: 0  
 Accepted Answers: d.

9) A building contractor subcontracts a job involved hanging wallpaper to a local merchant. To have an idea of the quality level of the merchant's work, the contractor randomly selects 300 ft<sup>2</sup> and counts the number of blemishes for 30 samples is 80. What is the centre line and control limits for an appropriate chart? Is it reasonable for the contractor to set a goal of an average of 0.5 blemishes per 100 ft<sup>2</sup>. 5 points

a. 2.667, (0, 7.566), Capable  
 b. 2.667, (0, 7.566), Not Capable  
 c. 1.336, (0, 5.366), Capable  
 d. 1.336, (0, 5.366), Not Capable

a.  
 b.  
 c.  
 d.

No, the answer is incorrect. Score: 0  
 Accepted Answers: b.

10) Observations are taken from the output of a company making semiconductors. Table below shows the sample size and the number of non-conforming semiconductors for each sample. Determine the general expression of the control limits for each sample ( $n_i$  is the sample size for the sample). 0 points

a.  $0.0423 \pm 0.6679/\sqrt{n_i}$   
 b.  $0.0523 \pm 0.6679/\sqrt{n_i}$   
 c.  $0.0423 \pm 0.5679/\sqrt{n_i}$   
 d.  $0.0523 \pm 0.7679/\sqrt{n_i}$

a.  
 b.  
 c.  
 d.

No, the answer is incorrect. Score: 0  
 Accepted Answers: b.

11) The number of typographical errors is counted over a certain number of pages for each sample. The data for 25 samples is shown in the table below. The number of pages used for each sample is not fixed. Construct a control chart for the number of typographical errors per page. Which sample plots above the UCL? What is the revised centre line deleting this sample? 5 points

Sample	Pages inspected	Errors	Sample	Pages inspected	Errors
1	10	4	14	4	3
2	5	3	15	8	2
3	8	8	16	8	4
4	6	4	17	12	6
5	12	14	18	10	8
6	10	8	19	12	10
7	8	4	20	8	5
8	10	5	21	6	8
9	6	2	22	10	4
10	8	12	23	10	5
11	10	7	24	8	4
12	12	5	25	12	5
13	6	15			

a. 21, 0.6573  
 b. 13, 0.6573  
 c. 21, 0.4589  
 d. 13, 0.4589

a.  
 b.  
 c.  
 d.

No, the answer is incorrect. Score: 0  
 Accepted Answers: b.