Statistical tables and graphs are allowed

Answer all the Following Questions:

Question 1 (12 Marks)

a) Control charts for $\bar{x}$ and s are maintained on a quality characteristic. The sample size is n = 4. After 30 samples, we obtained:

$$\sum_{i=1}^{30} \bar{x}_i = 12870 \qquad and \qquad \sum_{i=1}^{30} s_i = 410$$

i- Find the control limits for the $\bar{x}$ and s charts. [4 marks]

ii- Assuming that the process is in statistical control, estimate the process standard deviation. [2 marks]

b) Specifications on a normally distributed dimension are 600 ± 20. Samples of size (n=9) are collected to construct $\bar{x}$ and R charts. The charts are maintained on this dimension and have been in control over a long period of time. The control limits of these charts are as follows: [6 marks]

$\bar{x}$ chart	R chart
UCL=616	UCL=32.36
Center line=610	Center line= 17.82
LCL=604	LCL=3.28

i- Estimate the potential process capability

ii- Estimate the actual process capability

iii- Decide whether the process is capable or not. What is your recommendation regarding this process?

Question 2 (8 Marks)

The data shown in the following Table represent the number of nonconforming assemblies in samples of size 50. Construct a fraction nonconforming control chart (p chart) using the given data. Does the process seem to be in control? If not, assume that assignable causes can be found for all points outside the control limits and draw the revised control chart.

lot number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
number of nonconforming	4	3	8	12	7	15	20	13	9	8	5	14	9	1	2	9	3	13	6	9

Question 3 (12=4+8 Marks)

A. What are the situations that acceptance sampling plans can be performed?
Explain advantages and disadvantages of these plans.

B. Suppose that an automobile assembly plant is interested in a single-sampling plan with $\alpha = 0.01$, $\beta = 0.10$, $p_1 = 0.04$, and $p_2 = 0.16$. Design the required single sampling plan – Draw the OC curve for this plan.

Question 4 (8 Marks)

Design a double sampling plan with $\alpha = 0.05$, $\beta = 0.10$, $p_1 = 0.02$, and $p_2 = 0.08$.

At $p = 0.05$ use your double sampling plan to find the probability of acceptance P_a and average sample number ASN.

***************End of Questions ***************

Best Wishes,
Dr. Mohamed Sharaf
Dr. Oamyma Nada

This exam measures the following ILOs								
Question Number	Q1-a Q3-a	Q2-B	Q3-a	Q1-a	Q1-b Q3-b	Q1-b Q2	Q4	Q3-b	Q2, Q4
Skills	a1-1	a15-1	a15-2	a19-1	b1-1	b16-1	b17-1	c1-1	c14-1
	Knowledge &Understanding Skills				Intellectual Skills			Professional Skills	