PROGRAM	:	BACHELOR ENGINEERING TECHNOLOGY IN ENGINEERING METALLURGY
SUBJECT	:	**QUATILY TECHNIQUES**
CODE	:	**QUAMTB2**
DATE	:	SUPLEMMENTARY EXAMINATION 2019
DURATION	:	(SESSION) 08:30– 11:30
WEIGHT	:	40:60
FULL MARKS	:	100
TOTAL MARKS	:	100

EXAMINER	:	MR K. MALANDALA
MODERATOR	:	MR E. GONYA
NUMBER OF PAGES	:	4 PAGES

INSTRUCTIONS TO STUDENTS:

1. ANSWER ALL QUESTIONS.

2. DRAW NEAT DIAGRAMS AND WRITE CLEARLY, MARKS CAN BE DEDUCTED FOR UNTIDY WORK.
3. ROUND OFF ANSWER TO 3 DECIMAL PLACES

Question 1 **[8]**

Define the following terms:

1.1 Control chart (2)
1.2 Six sigma (2)
1.3 Attributes (2)
1.4 Nonconforming (2)

Question 2 **[6]**

What are the objectives of nonconforming charts?

Question 3 **[20]**

The following data are the diameters in centimeters of 50 steel shafts

115	125	124	115	120	125	120	122	133	128
120	132	115	120	123	123	118	120	120	123
119	118	124	125	120	115	126	118	119	125
123	121	117	124	117	119	123	123	121	121
124	125	125	122	120	118	124	129	123	127

3.1 Construct a tally sheet. (9)

3.2 Calculate the Range. (2)

3.3 Construct a grouped frequency distribution showing the cell midpoints, cell boundaries and cumulative less than frequency. (9)

Question 4 **[12]**

The following table gives the Brinell hardness of hardened tool in kilograms per square millimeter:

Subgroup number	Date	X_1	X_2	X_3	Comments
1	24 March	500	480	523	
2	26 March	625	700	720	oil
3		522	510	496	
4		512	509	505	
5	28 March	495	612	564	
6		295	250	280	equipment
7		650	760	750	Bad material
8		525	543	567	
9	29 march	487	475	675	
10		467	510	543	
11	30 March	512	527	509	

4.1 Determine the central line, the upper and lower limits of the average control chart

(6)

4.2 Construct the average control chart and the comment on the findings

(6)

Question 5 **[11]**

The average weight of 40 iron castings is 46,77 kg with a standard deviation of 3,9 kg.

5.1 How many casting weigh less than 49,6 kg? (5)

5.2 How many casting weigh between 45 and 50 kg? (6)

Question 6 **[15]**

For the following data, calculate the central line, the upper and lower limits for the control chart and state if the process is in control.

Date	Number Inspected (n)	Number of Nonconforming(np_
January 1	1250	35
3	1240	23
5	1200	55
6	1230	43
7	1220	31
8	1205	29
9	1222	34
10	1201	25
11	1209	50

Question 7 **[10]**

The count of nonconformities is 1000 square metres of rolled aluminum foil is 2. What is the probability of having?

7.1 Two nonconformities (5)

7.2 At most three nonconformities (5)

Question 8 **[9]**

The producer risk is defined by α = 0.05 for 2.3 % nonconforming units, and the consumer risk is given by $\beta = 0.10$ for 3.1 % nonconforming units. Set a sampling plan that exactly meets the producer stipulation and comes close as possible to the consumer stipulation.

Question 9 **[9]**

A credit card manager wishes to determine the proportion of customer calls that result in a dissatisfied customer. Based on some preliminary data, she estimates the percentage to be 10 %. A precision of 15 % and confidence level of 90 % are desired. What is the sample size?