UNIVERSITY OF JOHANNESBURG

PROGRAM	:	BACHELOR ENGINEERING TECHNOLOGY IN ENGINEERING METALLURGY
SUBJECT	:	**QUATILY TECHNIQUES**
CODE	:	**QUAMTB2**
DATE	:	MAIN EXAMINATION 2019
DURATION	:	(SESSION) 08:30– 11:30
	:	16/11/2019
WEIGHT	:	40:60
FULL MARKS	:	95
TOTAL MARKS	:	95

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 **[6]**

Define the following terms:

1.1 Quality control (2)
1.2 Quality function deployment (2)
1.3 A lean enterprise (2)

Question 2 **[9]**

What are the limitations of the variable control charts? (9)

Question 3 **[21]**

The following data are the weights in kilograms of 40 steel shafts:

2.61	2.70	2.46	2.49	2.52	2.61	2.42	2.37	2.75	2.63	2.66	2.71	2.75	2.59	2.54
2.55	2.59	2.45	2.34	2.77	2.52	2.46	2.72	2.64	2.50	2.39	2.47	2.73	2.69	2.56
2.39	2.55	2.49	2.53	2.75	2.45	2.69	2.55	2.66	2.87					

3.1 Construct a tally sheet (5)

3.2 Construct a grouped frequency distribution (6)

3.2 Using information in 3.2, calculate the mean and the median (5)

3.3 Calculate the standard deviation (5)

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	X_4	Comments
1	24 March	500	480	523	498	
2	26 March	625	700	720	760	oil
3		522	510	496	495	
4		512	509	505	500	
5	28 March	495	612	564	533	
6		295	250	280	300	equipment
7		650	760	750	700	Bad material
8		525	543	567	456	
9	29 march	487	475	675	567	
10		467	510	543	617	
11	30 March	512	527	509	501	

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

(6)

4.2 Construct a standard deviation control chart and the comment on the findings

(6)

Question 5 **[8]**

5.1 If the mean time to clean an engine is 15 min and the standard deviation is 1.4 , what percentage of engines will take less than 13.5 min to complete? (4)

5.2 If the average number of nonconforming units is 1,8, What is the probability that a sample will contains 3 or less nonconforming units? (5)

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	1200	25
3	1200	33
5	1200	45
6	1200	53
7	1200	21
8	1200	39
9	1200	44
10	1200	15
11	1200	60

Question 7 **[6]**

Determine the equation for the OC curve for the following sampling plans:

7.1 N= 300, n_1= 40, c_1= 0, r_1= 2 , n_2 =70, c_2= 2 and r_2= 3 (3)

7.2 N= 800, n_1= 80, c_1= 2, r_1=4, n_2= 210, c_2= 5 and r_2=6 (3)

Question 8 **[9]**

The producer risk is defined by α = 0.10 for 1.5 % nonconforming units, and the consumer risk is given by $\beta = 0.05$ for 2.9 % nonconforming units. Set a sampling plan that exactly meets the producer stipulation and comes close as possible to the consumer stipulation.

Question 9 **[8]**

Given $p_{0.10}$ = 0.62 and $p_{0.95}$ = 0.013, determine the single sampling plane that exactly meets the consumer's stipulation and comes a close as possible to the producer's stipulation.