SYSC 4106: Assignment 3 March 24, 2020

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Question 1

Year	Project 1 Cash Flow ($)	Discount Factor @ 8%	Discounted Cash Flow
0	-100,000	1.0000	-100,000
1	10,000	0.9259	9,529
2	10,000	0.8573	8,573
3	10,000	0.7938	7,938
4	20,000	0.7350	14,700
5	100,000	0.6806	68,060
Net Profit	50,000		NPV = $8800

A. The ROI of the project is (10,000 / 100,000) x 100 = 10%.
B. See table.
C. See table.

Question 2

A. Based on the Laplace rule, Xenon Software would purchase C1 equipment because it has the highest average payoff.

Equipment	P1	P2	P3	Average Payoff
C1	100	90	60	(100+90+60) / 3 = 83.3333
C2	30	30	140	(30+30+140) / 3 = 66.6667
C3	70	80	90	(70+80+90) / 3 = 80.0000
C4	100	20	120	(100+20+120) / 3 = 80.0000

B. Based on the Maximin rule, Xenon Software would purchase C3 equipment because it is the best of the worst payoffs.

Equipment	P1	P2	P3	Worst Payoff
C1	100	90	60	60
C2	30	30	140	30
C3	70	80	90	70
C4	100	20	120	20

C. Based on the Maximax rule, Xenon Software would purchase C2 equipment because it has the best payoff of the best payoffs.

Equipment	P1	P2	P3	Best Payoff
C1	100	90	60	100
C2	30	30	140	140
C3	70	80	90	90
C4	100	20	120	120

D. Based on the Hurwicz rule, Xenon Software would purchase C3 equipment because it has the best of the blended payoffs.

Equipment	Best Payoff	Worst Payoff	α = 0.3	Blended Payoff
C1	100	60	0.3*100 + 0.70*60	72
C2	140	30	0.3*140 + 0.70*30	63
C3	90	70	0.3*90 + 0.70*70	76
C4	120	20	0.3*120 + 0.70*20	50

E. Based on the Minimax Regret rule, Xenon Software would purchase C3 equipment because it has the smallest maximum regret.

Equipment	State of Nature 1	State of Nature 2	State of Nature 3	Maximum Regret
C1	100-100=0	90-90=0	140-60=80	80
C2	100-30=70	90-30=60	140-140=0	70
C3	100-70=30	90-80=10	140-90=50	50
C4	100-100=0	90-20=70	140-120=20	70

Question 3

NUMBER OF RECORDS (s)	ROUTINE 1 (t = 7.5s2 – 570s + 12112)	ROUTINE 1 (s per t)	ROUTINE 2 (t = 4s2 – 384s + 9621)	ROUTINE 2 (s per t)
1	11549.50	11549.50	9241.00	9241.00
10	7162.00	716.20	6181.00	618.10
20	3712.00	185.60	3541.00	177.05
30	1762.00	58.73	1701.00	56.70
35	1349.50	38.56	1081.00	30.89
40	1312.00	32.80	661.00	16.53
45	1649.50	36.66	441.00	9.80
46	1762.00	38.30	421.00	9.15
47	1889.50	40.20	409.00	8.70
48	2032.00	42.33	405.00	8.44
49	2189.50	44.68	409.00	**8.35**
50	2362.00	47.24	421.00	8.42
55	3449.50	62.72	601.00	10.93
60	4912.00	81.87	981.00	16.35
70	8962.00	128.03	2341.00	33.44
80	14512.00	181.40	4501.00	56.26
90	21562.00	239.58	7461.00	82.90
100	30112.00	301.12	11221.00	112.21
1000	6942112.00	6942.11	3625621.00	3625.62
10000	744312112.00	74431.21	396169621.00	39616.96
100000	74943012112.00	749430.12	39961609621.00	399616.10
1000000	7499430012112.00	7499430.01	3999616009621.00	3999616.01
10000000	749994300012112.00	74999430.00	399996160009621.00	39999616.00
100000000	74999943000012100.00	749999430.00	39999961600009600.00	399999616.00
1000000000	7499999430000010000.00	7499999430.00	3999999616000010000.00	3999999616.00

To get the best overall optimal performance, where t is the execution time (in milliseconds), *Routine 2* should be selected because regardless of the number of records, because the time required to process data is always lower. The size of the input stream should be *49 records* because the number of records processed per millisecond is at the fastest rate.

Question 4

Components	Defects	mR
1	12	4
2	16	2
3	18	14
4	32	10
5	22	6
6	16	7
7	23	12
8	35	20
9	15	12
10	27	11
11	16	9
12	25	5
13	20	6
14	26	6
15	20	3
16	23	0
17	23	13
18	36	14
19	22	5
20	27	10
21	17	
Average	**Am = 22.42857**	**mR = 8.45**

A. See table.

B. **UCL** = mR * 3.268 = 8.45 *3.268 = **27.62**

C. See Moving Range Control Chart graph on next page.

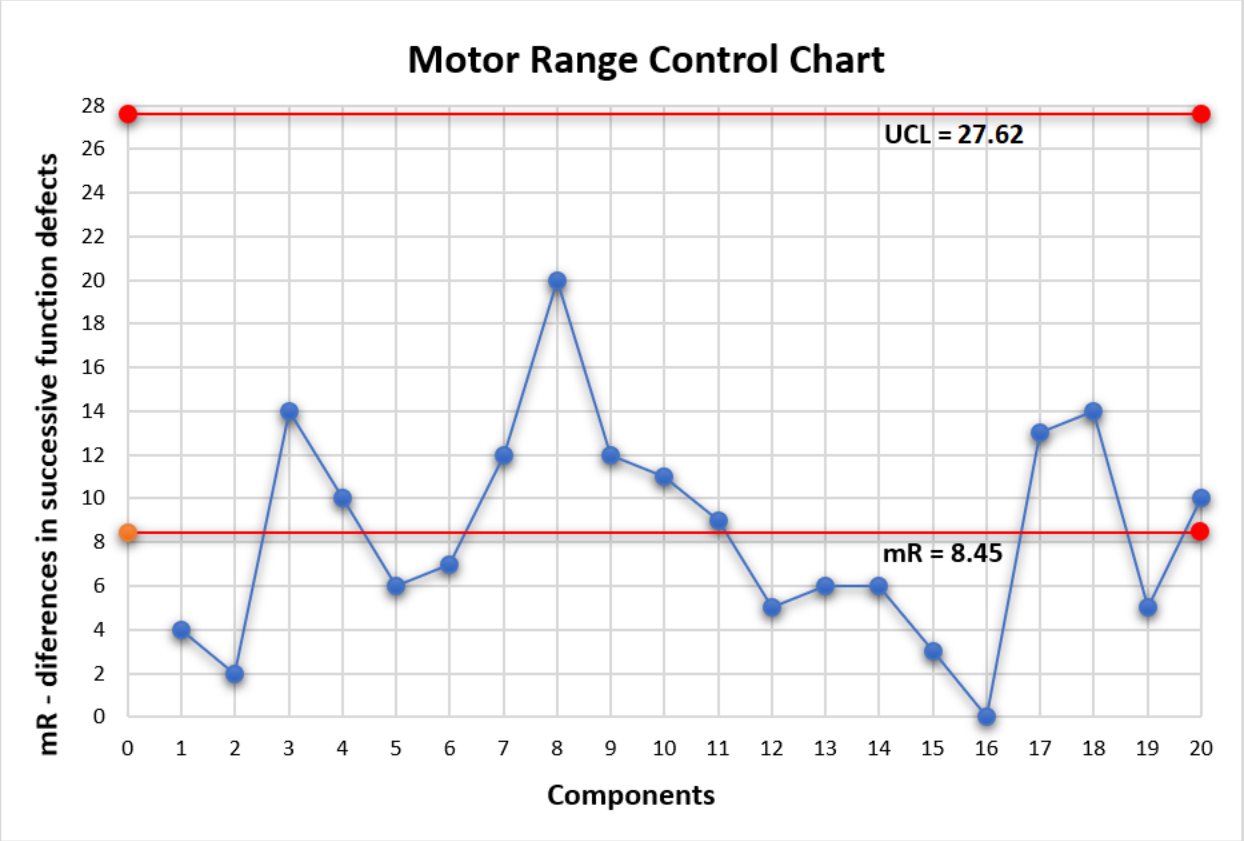
D. All of the defect values are inside the UCL meaning the data dispersion is stable. This means that there are no signals in the process data that indicates that a process is not in control.

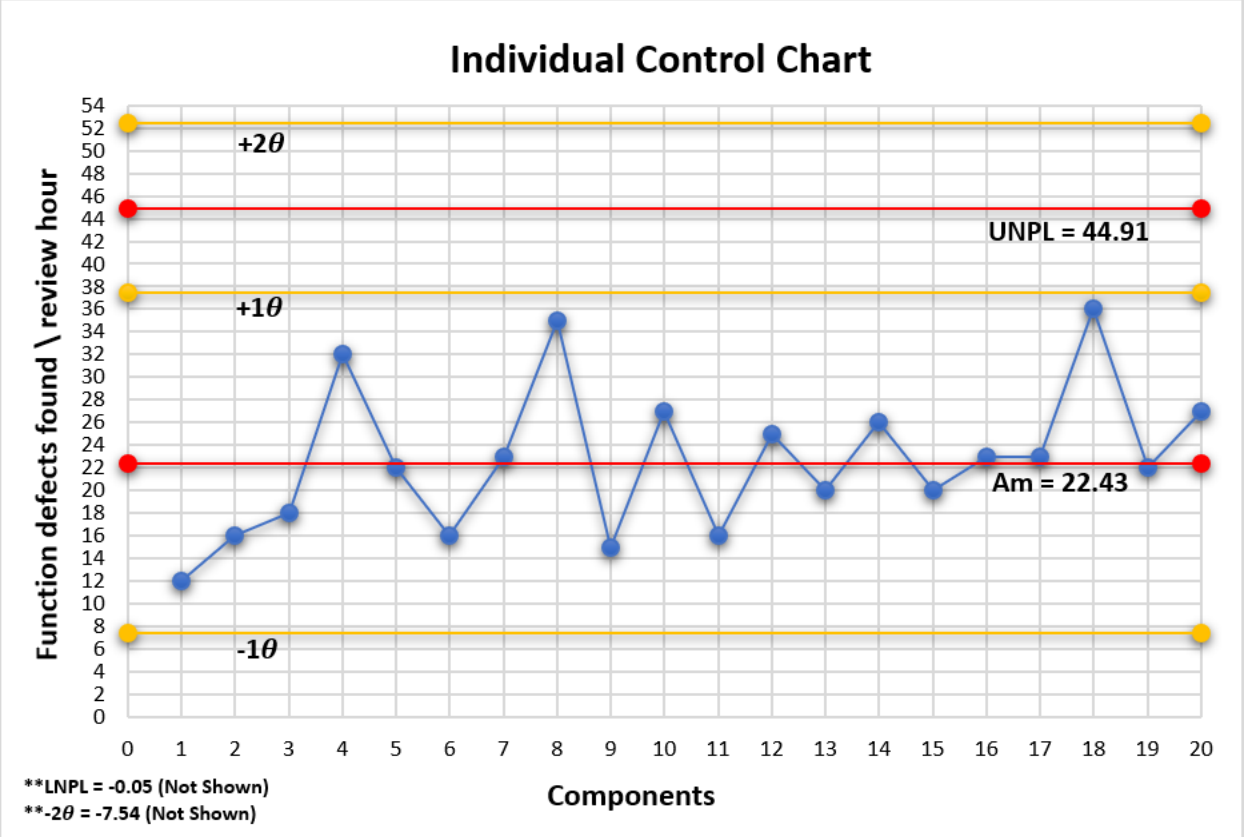
E. **UNPL** = mR * 2.660 + Am = **44.91**

F. **LNPL** = Am – mR * 2.660 = **-0.05** (Need not be plotted because it is < 0 and the metrics are all >= 0)

G. See Individual Control Chart graph on next page.

H. The data dispersion is capable because all of zone/test rules are false. There is not single metric value that is outside the UNPL. There are no metric values that lie more than one or two standard deviations away from Am. Lastly, eight consecutive metrics never lie on onside of Am. This shows that there is no process out of control.


Motor Range Control Chart
UCL = 27.62
mR = 8.45
mR - diferences in successive function defects
Components


Individual Control Chart
+2θ
UNPL = 44.91
+1θ
Am = 22.43
-1θ
Function defects found \ review hour
Components
**LNPL = -0.05 (Not Shown)
**-2θ = -7.54 (Not Shown)