
UNIVERSITI SAINS MALAYSIA

Second Semester Examination
Academic Session 2006/2007

April 2007

MSG 262 – Quality Control
[Kawalan Mutu]

Duration : 3 hours
[Masa : 3 jam]

Please check that this examination paper consists of THIRTEEN pages of printed material before you begin the examination.

[Sila pastikan bahawa kertas peperiksaan ini mengandungi TIGA BELAS muka surat yang bercetak sebelum anda memulakan peperiksaan ini.]

Instructions: Answer **all four** [4] questions.

Arahan: Jawab **semua empat** [4] soalan.]

...2/-

1. (a) Write short notes on the topics below:

- (i) The Shewhart cycle
- (ii) 5 S
- (iii) Consumer research
- (iv) Root causes
- (v) Process variation

[100 marks]

2. (a) What is the 'Magnificent Seven'? Then give two examples to illustrate the 'Magnificent Seven'.

[30 marks]

(b) Besides the 'Magnificent Seven', what else is used to improve the production system? Describe at least two initiatives on the production floor you have seen and heard during the industrial visit to Robert Bosch Sdn. Bhd.

[30 marks]

(c) Selecting the theme in QC Circle Activities is an important issue. A questionnaire survey was carried out among 512 QC Circle leaders and they were asked to "Please only select the one theme that your current activities are aimed at". The themes that were selected by 476 of the Circle leaders are shown in Table 2c.

Table 2c. Themes for QC Circle Activities

Theme	No. of Circles
Quality improvement	160
Cost reduction	214
Safety	17
Morale improvement	5
Equipment improvement	33
Pollution prevention	5
Upgrading control	25
Study	4
Others	13
Total	476

Which SPC tool would you use to show the themes chosen by the QC Circles? How would you use this tool? What are your conclusions?

[40 marks]

1. (a) Tuliskan nota pendek tentang tajuk-tajuk di bawah:

- (i) Kitaran Shewhart
- (ii) 5 S
- (iii) Penyelidikan konsumen
- (iv) Sebab-sebab punca
- (v) Variasi proses

[100 markah]

2. (a) Apakah 'Magnificent Seven'? Kemudian beri dua contoh untuk mengilustrasikan 'Magnificent Seven'?

[30 markah]

(b) Selain daripada 'Magnificent Seven', apa lagi yang dapat digunakan untuk memperbaiki sistem pengeluaran? Perihal sekurang-kurangnya dua inisiatif pada lantai pengeluaran yang anda telah lihat dan dengar semasa lawatan industri ke Robert Bosch Sdn. Bhd.

[30 markah]

(c) Pemilihan tema dalam Aktiviti-aktiviti Kumpulan Kawalan Mutu adalah suatu isu yang penting. Suatu kajian soalselidik dilaksanakan antara 512 pemimpin Kumpulan Kawalan Mutu dan mereka ditanya "Sila hanya pilih satu tema yang aktiviti-aktiviti ditujukan". Tema-tema yang dipilih oleh 476 pemimpin Kumpulan Kawalan Mutu ditunjukkan dalam Jadual 2c.

Jadual 2c. Tema bagi Aktiviti-Aktiviti Kumpulan Kawalan Mutu.

Tema	Bilangan Kumpulan
Pembaikan mutu	160
Pengurangan kos	214
Keselamatan	17
Pembaikan semangat	5
Pembaikan alat-alat	33
Pencegahan pencemaran	5
Kawalan kenaikan	25
Pembelajaran	4
Lain-lain	13
Jumlah	476

Apakah alat SPC yang anda akan gunakan untuk menunjukkan tema-tema yang dipilih oleh kumpulan-kumpulan Kawalan Mutu? Bagaimanakah anda akan menggunakan alat ini? Apakah kesimpulan anda?

[40 markah]

.../4-

3. (a) Define a process. Consider a process which you are currently involved in. Then describe the process with the aid of a flow diagram. How would you identify the bottlenecks in your process?

[20 marks]

- (b) Explain the concepts of the stability of a process. Why is it important to have a stable process? If the process is not stable, how do we manage this problem?

[20 marks]

- (c) The staff in the general office at the headquarters of M Insurance Company believe that the telephone is an important means of communication. They therefore carried out improvement activities to reduce the time taken to answer the telephone with the slogan 'Do not make customers wait nor pass around the telephone'.

They randomly surveyed 200 calls a day made to their north and south branches, and recorded the number of calls that took more than 11 seconds before it was answered. The data that was recorded is shown in Table 3c.

Prepare a control chart and describe the information that can be obtained. Why is stratification important?

(Note:- $CL = \bar{p}n$, $UCL = \bar{p}n + 3\sqrt{\bar{p}n(1-\bar{p})}$, $LCL = \bar{p}n - 3\sqrt{\bar{p}n(1-\bar{p})}$)

[60 marks]

.../5-

3. (a) Takrifkan suatu proses. Pertimbangkan suatu proses yang anda sedang alami. Kemudian perihai proses itu dengan menggunakan suatu gambarajah aliran. Bagaimanakah anda dapat mengecam masalah-masalah dalam proses anda?

[20 markah]

- (b) Jelaskan konsep-konsep kestabilan bagi suatu proses. Mengapakah kestabilan proses adalah penting? Jika proses tak stabil, bagaimanakah kita dapat mengurus masalah ini?

[20 markah]

- (c) Staf dalam pejabat am di ibu pejabat Syarikat Insurans M percaya bahawa telefon adalah suatu alat komunikasi yang penting. Maka mereka melaksanakan aktiviti-aktiviti pembaikan untuk mengurang masa yang diambil untuk menjawab telefon dengan slogan 'Jangan membuat pelanggan menunggu dan jangan melepaskan panggilan kepada staf lain'.

Mereka mengkaji secara rawak 200 panggilan sehari yang telah dibuat ke cawangan-cawangan utara dan selatan, dan mencatat bilangan panggilan yang mengambil lebih daripada 11 saat sebelum ia dijawab. Data yang dicatat ditunjukkan dalam Jadual 3c.

Sediakan suatu carta kawalan dan perihai maklumat yang diperolehi. Mengapakah penstratuman adalah penting?

(Perhatian:- $CL = \bar{p}n$, $UCL = \bar{p}n + 3\sqrt{\bar{p}n(1-\bar{p})}$, $LCL = \bar{p}n - 3\sqrt{\bar{p}n(1-\bar{p})}$).

[60 markah]

Table 3c. Telephone data.

Subgroup No.	Subgroup size, n	No. of defective cases, pn	
		South Branch	North Branch
1	200	11	2
2	200	9	5
3	200	7	6
4	200	12	1
5	200	8	2
6	200	9	7
7	200	6	8
8	200	15	0
9	200	6	3
10	200	11	5
11	200	21	5
12	200	13	3
13	200	24	4
14	200	8	7
15	200	3	7
16	200	14	5
17	200	8	5
18	200	9	6
19	200	8	5
20	200	3	2
21	200	6	4
22	200	5	3
23	200	26	2
24	200	3	5
25	200	8	4
26	200	9	5
27	200	7	8
28	200	20	2
29	200	6	6
30	200	8	2
Total	6,000	303	129

.../7-

Jadual 3c. Data telefon.

<i>No. Subkumpulan</i>	<i>Saiz subkumpulan, n</i>	<i>Bilangan kes defektif, pn</i> <i>Cawangan Selatan</i>	<i>Bilangan kes defektif, pn</i> <i>Cawangan Utara</i>
1	200	11	2
2	200	9	5
3	200	7	6
4	200	12	1
5	200	8	2
6	200	9	7
7	200	6	8
8	200	15	0
9	200	6	3
10	200	11	5
11	200	21	5
12	200	13	3
13	200	24	4
14	200	8	7
15	200	3	7
16	200	14	5
17	200	8	5
18	200	9	6
19	200	8	5
20	200	3	2
21	200	6	4
22	200	5	3
23	200	26	2
24	200	3	5
25	200	8	4
26	200	9	5
27	200	7	8
28	200	20	2
29	200	6	6
30	200	8	2
<i>Total</i>	<i>6,000</i>	<i>303</i>	<i>129</i>

4. (a) The manager of Bank X noted that the processing of documents for approval from the head office took a long time and therefore decided to 'shorten the time taken for processing documents for approval'.

He chose five documents a day at random and recorded the time that was taken for processing the documents. Table 4a.1 shows the data before improvement.

Table 4a.1. Data before improvement.

Subgroup No.	D1	D2	D3	D4	D5
1	11	12	8	7	13
2	13	10	5	7	15
3	11	11	7	10	9
4	14	15	12	13	10
5	10	1	12	12	3
6	4	7	8	13	12
7	7	8	10	6	12
8	15	12	11	11	12
9	10	10	11	9	6
10	12	6	5	12	14
11	15	5	14	14	10
12	13	9	12	7	10
13	8	15	7	12	7
14	9	12	3	11	10
15	11	6	12	14	12
16	6	7	9	8	10
17	3	16	10	14	4
18	5	5	8	9	10
19	8	9	10	12	9
20	17	15	16	8	10
21	9	12	9	4	7
22	7	8	7	13	11
23	3	9	10	13	11
24	13	12	14	8	13
25	14	9	8	5	12

After the data analysis, they found some problems such as unclear process procedure and unnecessary circulation of documents for approval. Therefore they standardized the document approval process such as the process procedure and the circulation list, and modified the regulations. Table 4a.2 shows the data after implementation of these improvement activities.

4. (a) Seorang pengurus Bank X perhatikan bahawa pemprosesan dokumen untuk kelulusan dari ibu pejabat mengambil masa yang panjang dan maka beliau ingin 'mengurangkan masa pemprosesan dokumen untuk kelulusan'.

Beliau memilih lima dokumen sehari secara rawak dan mencatat masa yang diambil untuk memproses dokumen. Jadual 4a.1 menunjukkan data sebelum pembaikan.

Jadual 4a.1. Data sebelum pembaikan.

Subgroup No.	D1	D2	D3	D4	D5
1	11	12	8	7	13
2	13	10	5	7	15
3	11	11	7	10	9
4	14	15	12	13	10
5	10	1	12	12	3
6	4	7	8	13	12
7	7	8	10	6	12
8	15	12	11	11	12
9	10	10	11	9	6
10	12	6	5	12	14
11	15	5	14	14	10
12	13	9	12	7	10
13	8	15	7	12	7
14	9	12	3	11	10
15	11	6	12	14	12
16	6	7	9	8	10
17	3	16	10	14	4
18	5	5	8	9	10
19	8	9	10	12	9
20	17	15	16	8	10
21	9	12	9	4	7
22	7	8	7	13	11
23	3	9	10	13	11
24	13	12	14	8	13
25	14	9	8	5	12

Selepas data dianalisis, mereka mendapati masalah-masalah seperti prosedur proses tidak jelas dan edaran dokumen untuk kelulusan tidak perlu. Maka mereka mempiawaikan proses kelulusan dokumen seperti prosedur proses dan senarai edaran, dan membuat perubahan peraturan. Jadual 4a.2 menunjukkan data selepas pengendalian aktiviti-aktiviti pembaikan.

Table 4a.2. Data after improvement.

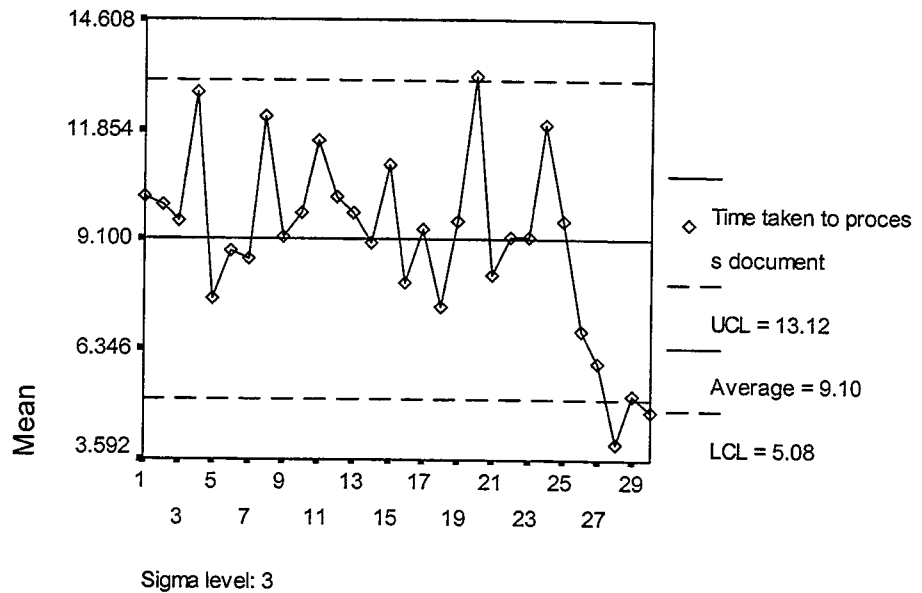
Subgroup No.	D1	D2	D3	D4	D5
26	9	5	7	8	5
27	4	9	8	6	3
28	2	6	3	5	4
29	6	2	7	3	8
30	5	2	6	4	7

The Figure below shows the control charts using the data before and after improvement. Interpret the results. What are your conclusions?

[40 marks]

X-bar-R Control Chart

Before and After Improvement



Jadual 4a.2. Data selepas pembaikan.

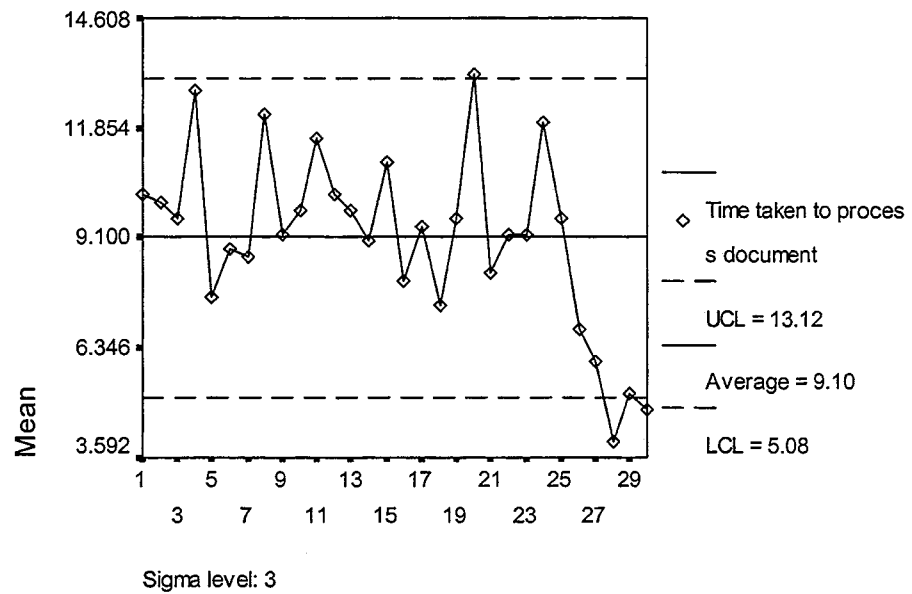
Subgroup No.	D1	D2	D3	D4	D5
26	9	5	7	8	5
27	4	9	8	6	3
28	2	6	3	5	4
29	6	2	7	3	8
30	5	2	6	4	7

Gambarajah di bawah menunjukkan carta-carta kawalan bagi data sebelum dan selepas pembaikan. Tafsirkan hasil-hasil. Apakah kesimpulan anda?

[40 markah]

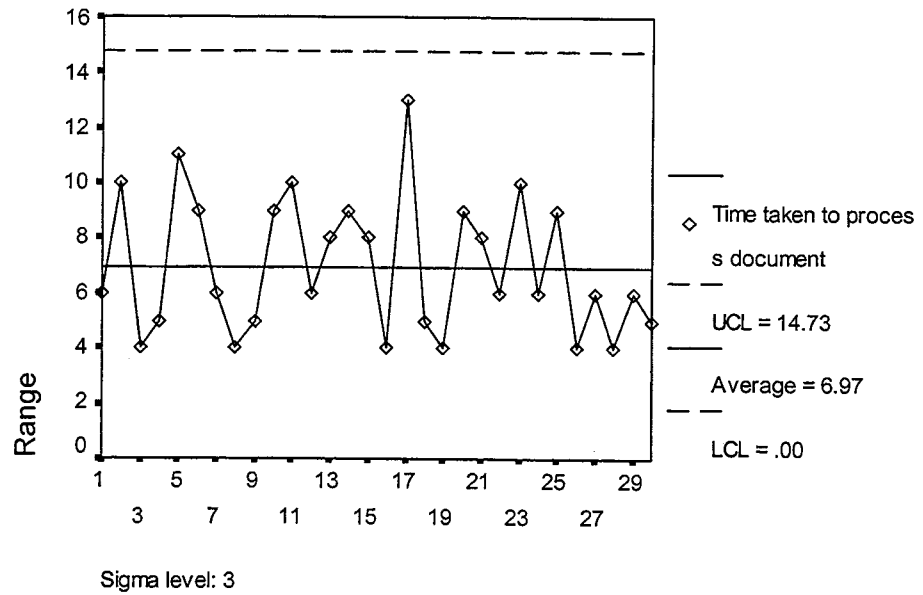
X-bar-R Control Chart

Before and After Improvement



X-bar-R Control Chart

Before and After Improvement



- (b) What are the advantages and disadvantages of the Shewhart control charts? Are there alternatives to the Shewhart control charts? Describe the alternatives using examples.

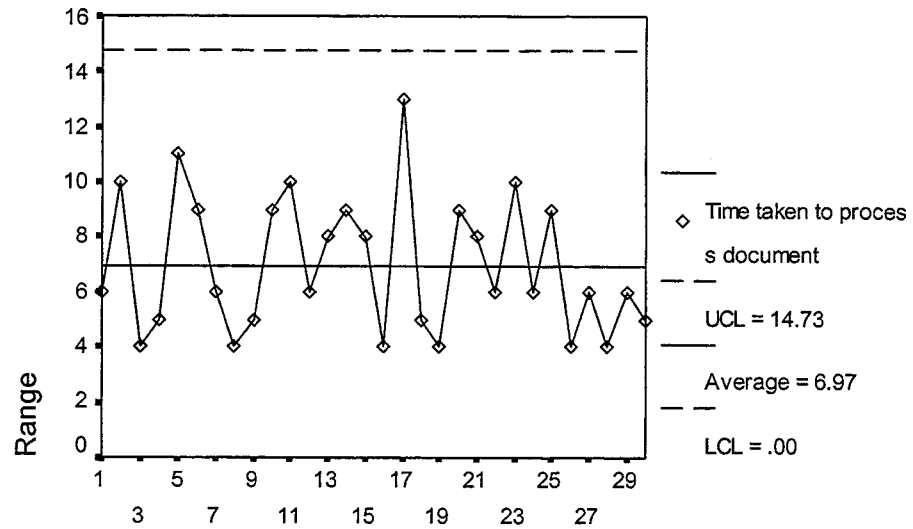
[30 marks]

- (c) 'Build quality into the product'. 'Inspect quality into the product'. What do you think of these phrases? How is acceptance sampling used in process control? Describe the sampling plans with illustrations.

[30 marks]

X-bar-R Control Chart

Before and After Improvement



Sigma level: 3

- (b) *Apakah kebaikan dan keburukan carta-carta kawalan Shewhart? Adakah terdapat alternatif kepada carta-carta kawalan Shewhart? Perihal alternatif tersebut dengan menggunakan contoh.*

[30 markah]

- (c) *'Bina kualiti ke dalam produk'. 'Periksa kualiti ke dalam produk'. Apakah pendapat anda tentang kedua-dua frasa ini? Bagaimanakah pensampelan penerimaan digunakan dalam kawalan proses? Perihal pelan-pelan pensampelan dengan menggunakan ilustrasi.*

[30 markah]

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