
UNIVERSITI SAINS MALAYSIA

Second Semester Examination
Academic Session 2008/2009

April/May 2009

EBB 342/3 – Quality Control & Management
[Kawalan & Pengurusan Mutu]

Duration : 3 hours
[Masa : 3 jam]

Please ensure that this examination paper contains FIFTEEN printed pages before you begin the examination.

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

This paper contains SEVEN questions.

[Kertas soalan ini mengandungi TUJUH soalan.]

Instruction: Answer FIVE questions. If candidate answers more than five questions only the first five questions answered in the answer script would be examined.

[Arahan: Jawab LIMA soalan. Jika calon menjawab lebih daripada lima soalan hanya lima soalan pertama mengikut susunan dalam skrip jawapan akan diberi markah.]

The answers to all questions must start on a new page.

[Mulakan jawapan anda untuk semua soalan pada muka surat yang baru.]

You may answer a question either in Bahasa Malaysia or in English.

[Anda dibenarkan menjawab soalan sama ada dalam Bahasa Malaysia atau Bahasa Inggeris.]

1. [a] Relate quality and profitability?

Kaitkan mutu dengan keuntungan?

(30 marks/markah)

- [b] What are "Management" and "Management Function"?

Apakah "Pengurusan" dan "Fungsi Pengurusan"?

(20 marks/markah)

- [c] Explain Juran's Quality Trilogy.

Terangkan "Juran's Quality Trilogy".

(40 marks/markah)

- [d] What is the principal purpose of a quality policy statement in a quality management system?

Apakah tujuan utama pernyataan polisi mutu dalam sistem pengurusan mutu?

(10 marks/markah)

2. [a] What are the objectives of having ISO 9001:2000 standards?

Apakah objektif-objektif piawaian ISO 9001:2000?

(30 marks/markah)

- [b] Define the following terms.

- (i) Standards
- (ii) Accrediation

Takrifkan istilah berikut:

- (i) Piawaian
- (ii) Akreditasi

(10 marks/markah)

- [c] Discuss the hierarchy of documentation in a typical quality management system.

Terangkan hiraki dokumentasi di dalam sistem pengurusan mutu.

(30 marks/markah)

- [d] What is "design of experiment" and when can this be applied?

Apakah "design of experiment" dan di manakah ia digunakan?

(30 marks/markah)

3. [a] By giving examples, explain the following terms:
- (i) Reliability.
 - (ii) Durability.
 - (iii) Robustness.

Dengan memberi contoh-contoh yang sesuai, terangkan istilah berikut:

- (i) *Kebolehharian.*
- (ii) *Kebolehtahanan.*
- (iii) *Ketegapan.*

(30 marks/markah)

- [b] An engineer evaluates incoming raw materials using the following single sampling plan: $N = 8000$, $n = 50$ and $c = 1$. Construct an operation curve (OC curve) and AOQ curves using at least 7 points and determine:
- (i) The AOQL value
 - (ii) The percent of AOQ
 - (iii) The probability of acceptance for a 1.0% nonconforming unit, and
 - (iv) The AQL value for producer's risk = 0.05.

Seorang jurutera menilai bahan-bahan mentah yang dibeli dengan menggunakan pelan pensampelan berikut: $N = 8000$, $n = 50$ dan $c = 1$. Plotkan satu lengkok Ciri-ciri Pengendalian (lengkuk OC) dan satu lengkok Mutu Purata Pengeluaran dengan menggunakan sekurang-kurangnya 7 titik. Tentukan:

- (i) *Nilai Mutu Purata Terhadap Pengeluaran*
- (ii) *Peratus bagi Mutu Purata Pengeluaran*
- (iii) *Penerimaan kebarangkalian bagi 1.0% unit tak sesuai, dan*
- (iv) *Tahap Mutu Kebolehterimaan bagi risiko pengeluar = 0.05.*

(40 marks/markah)

- [c] Using ANSI/ASQ Z1.4, a QC inspector needs to determine the single sampling plans for the following information:

Dengan menggunakan ANSI/ASQ Z1.4, seorang pemeriksa QC perlu menentukan pelan-pelan pensampelan tunggal seperti berikut:

	Inspection Level / <i>Tahap Pemeriksaan</i>	Inspection / <i>Pemeriksaan</i>	AQL / <i>Tahap Mutu Kebolehterimaan</i>	Lot Size / <i>Saiz Lot</i>
(a)	II	Tightened / <i>Diperketatkan</i>	1.0	5000
(b)	I	Normal / <i>Normal</i>	0.10	20

Explain the meaning of the sampling plan determined if (a) 5 nonconforming units are found in the sample and (b) 0 nonconforming units are found in the sample.

Terangkan maksud pelan-pelan pensampelan yang diperolehi jika (a) mempunyai 5 unit tak sesuai dan (b) mempunyai 0 unit tak sesuai.

(30 marks/markah)

4. [a] How could Six-Sigma being employed to improve an existing process and create a new product design?

Bagaimanakah "Six-Sigma" boleh digunakan untuk menambahbaikkan proses sedia ada dan memperkenalkan satu rekabentuk baru untuk sesuatu produk?

(50 marks/markah)

- [b] Table 1 contains 20 groups of data with a subgroup size of 50. The number of nonconforming units is shown in the last column.

- (i) Find the central line and control limits (CL, UCL and LCL).
- (ii) Draw the p chart.
- (iii) Is the process stable? How do you know?

Jadual 1 terdiri daripada 20 kumpulan data dengan saiz kumpulan 50. Bilangan unit rosak diberikan dalam lajur paling kanan.

- (i) Tentukan garis tengah dan had kawalan (CL, UCL dan LCL).*
- (ii) Lukis carta p .*
- (iii) Adakah proses ini stabil? Bagaimana anda tahu?*

Table 1 / *Jadual 1*

Group / <i>Kumpulan</i>	Number of entries inspected / <i>Bilangan yang diperiksa</i>	Number of defective entries / <i>Bilangan yang rosak</i>
1	50	5
2	50	6
3	50	3
4	50	6
5	50	8
6	50	5
7	50	4
8	50	5
9	50	6
10	50	7
11	50	4
12	50	4
13	50	3
14	50	5
15	50	4
16	50	2
17	50	4
18	50	5
19	50	1
20	50	6

(50 marks/*markah*)

5. [a] Figure 1(a) and 1(b) show typical control charts, where the area have been divided into zones. Identify if any points indicate a lack of control, and explain why.

Rajah 1(a) dan 1(b) menunjukkan carta kawalan biasa, di mana kawasan telah dibahagikan kepada zon-zon. Nyatakan apabila terdapat sebarang data yang menunjukkan kekurangan kawalan dan terangkan kenapa.

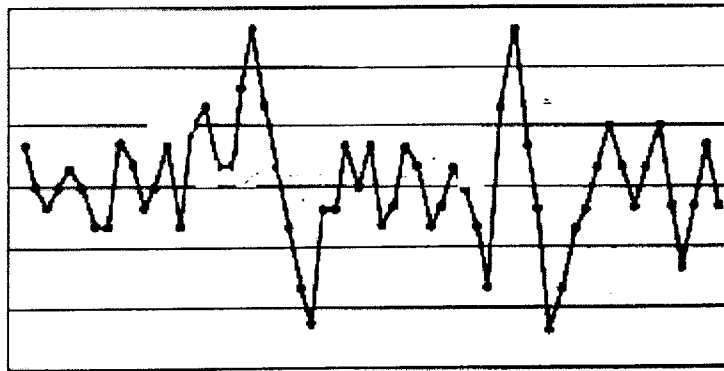


Figure 1(a) / Rajah 1(a)

(25 marks/markah)

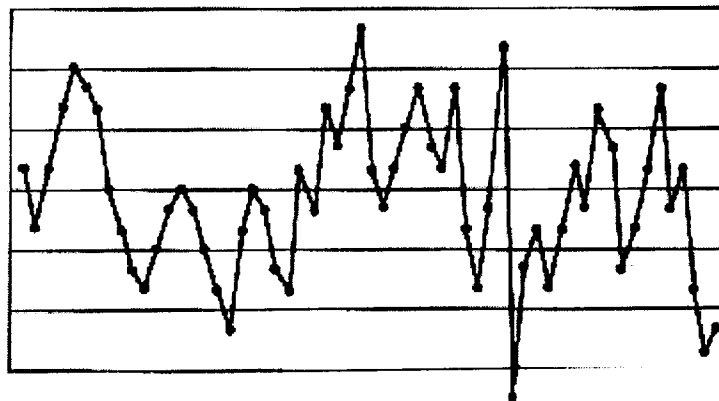


Figure 1(b) / Rajah 1(b)

(25 marks/markah)

- [b] A manufacturer of flashlight batteries took a sample of 20 batteries from a day's production and used them continuously until they were drained. The numbers of hours they were used until failure were:

Suatu pengilang bateri lampu suluh mengambil 20 sampel bateri daripada pengeluaran harian dan menggunakannya sehingga tenaganya lemah. Bilangan jam yang diperolehi sehingga bateri rosak ialah:

505, 345, 400, 342, 426, 317, 545, 264, 451, 1049, 631, 512, 266, 492, 562, 298, 308, 615, 275, 450

- (i) Compute the mean, median, mode, range and standard deviation for the time to failure.
- (ii) Are the above statistics useful to a production manager? If yes, why? If no, why not?
- (iii) Using the information above, how would you advise the manufacturer who wishes to use "should last 400 hours" as an advertisement slogan?

- (i) *Kira purata, median, mod, julat dan sisihan piawai.*
- (ii) *Adakah statistik di atas bermanfaat bagi pengurus pengeluaran? Jika ya, mengapa. Jika tidak, mengapa tidak?*
- (iii) *Dengan menggunakan maklumat ini, apa yang akan anda nasihatkan kepada pengilang apabila ingin mengiklankan bateri ini "bertahan sehingga 400 jam"?*

(50 marks/markah)

6. [a] The data in Table 1 show the wait times, in minutes, for 50 admissions into the SEM Laboratory. Draw a histogram and comment on the results. What action would you suggest?

Data dalam Jadual 1 menunjukkan masa menunggu dalam minit bagi 50 kemasukan ke Makmal SEM. Lukis histogram dan berikan ulasan berkaitan hasil ini. Tindakan apa yang anda akan cadangkan?

Tabel 1 / Jadual 1

24	22	24	30	24
16	18	32	27	69
26	36	41	27	43
29	26	21	39	44
25	32	30	28	26
34	21	30	30	31
32	37	64	26	68
20	32	43	31	24
20	27	30	33	39
40	22	31	29	43

(50 marks/markah)

- [b] Dean of an Engineering School is concerned about the scheduling of the XRD machine. A sample of $n = 4$ students was selected each day for 20 days and the waiting time for each student (in minutes) was measured with results as shown in the Table 2.
- (i) Construct the control chart (X-bar and R charts) for the data.
 - (ii) Is the process in control? If not, when does the out-of-control behavior occur?
 - (iii) Drop the out-of-control points (assumed that you have discovered and changed as special causes) and recomputed the control chart limit.

Dekan suatu Pusat Pengajian Kejuruteraan menitik beratkan penjadualan fasiliti XRD. Suatu sampel $n = 4$ pelajar telah dipilih setiap hari untuk 20 hari dan menunggu setiap pelajar (dalam minit) telah diukur dan hasilnya diberikan dalam Jadual 2.

- (i) Hasilkan carta kawalan (carta purata dan carta julat) bagi data ini.*
- (ii) Adakah proses ini keadaan terkawal? Jika tidak, bila keadaan tak terkawal terjadi?*
- (iii) Buang data tak terkawal (anggap bahawa perubahan yang wujud telah dikenalpasti sebagai kes khas) dan kira semula had kawalan carta.*

Table 2 / *Jadual 2*

Day / Hari	Patient / Pesakit			
	1	2	3	4
1	16.3	17.4	18.7	16.9
2	29.4	17.3	22.7	10.9
3	12.2	12.7	14.1	10.3
4	22.4	19.7	24.9	23.4
5	13.5	11.6	14.8	13.5
6	15.2	23.6	19.4	20.0
7	23.1	13.6	21.1	13.7
8	15.7	10.9	16.4	21.8
9	10.2	14.9	12.6	11.9
10	14.7	18.7	22.0	19.1
11	15.6	19.1	22.9	19.4
12	19.8	12.2	26.7	19.0
13	24.3	18.7	30.3	22.9
14	16.5	14.3	19.5	15.5
15	23.4	27.6	30.7	24.0
16	9.7	14.6	10.4	10.8
17	27.8	18.4	23.7	22.8
18	17.4	25.8	18.4	9.0
19	20.5	17.8	23.2	18.0
20	14.2	14.6	11.1	17.7

(50 marks/markah)

7. [a] Table 3 provides seven years of departmental accident data for a semiconductor industry.
- (i) What is the probability that an accident will occur in the wafer cleaning on Monday.
 - (ii) What is the probability that an accident will occur in soldering on Thursday.
 - (iii) What is the probability that an accident will occur on Friday.
 - (iv) What is the probability that an accident will occur in Receiving/Shipping.

Jadual 3 disediakan data tujuh tahun bahagian kemalangan suatu industri dobi.

- (i) *Tentukan kebarangkalian bahawa kemalangan akan terjadi ketika basuh wafer pada hari Isnin?*
- (ii) *Tentukan kebarangkalian bahawa kemalangan akan terjadi pematerian pada hari Khamis.*
- (iii) *Tentukan kebarangkalian bahawa kemalangan akan terjadi pada hari Jumaat.*
- (iv) *Tentukan kebarangkalian bahawa kemalangan akan terjadi dalam penerimaan dan penghantaran.*

Table3 / *Jadual 3*

Department / <i>Bahagian</i>	Number of Accidents / <i>Bilangan Kemalangan</i>					
	Monday <i>/ Isnin</i>	Tuesday <i>/ Selasa</i>	Wednesday <i>/ Rabu</i>	Thursday <i>/ Khamis</i>	Friday / <i>Jumaat</i>	Total / <i>Jumlah</i>
Receiving/Shipping / <i>Penerimaan/Penghantaran</i>	12	8	9	8	13	50
Wafer Cleaning / <i>Basuh Wafer</i>	30	19	21	27	33	130
Oxidation / <i>Oksidasi</i>	10	10	11	9	9	49
Soldering / <i>Pateri</i>	22	20	21	19	20	102
Total / <i>Jumlah</i>	74	57	62	63	75	331

(40 marks/*markah*)

...14/-

- [b] Data measurement given in Table 4.
- (i) Calculate the sample mean \bar{x} for each sample group, sample range R , average of the mean, $\bar{\bar{x}}$, and average of the range, \bar{R} .
 - (ii) Determine the central line and control limits for mean.
 - (iii) Determine the central line and control limits for range.
 - (iv) Construct the \bar{X} chart and R chart.
 - (v) If there exist any data which is out of control, due to special cases, perform changes in your chart

Data pengukuran diberikan dalam Jadual 4.

- (i) *Kira purata, \bar{x} bagi setiap kumpulan sampel, julat, R , purata bagi purata, $\bar{\bar{x}}$, dan purata bagi julat, \bar{R} .*
- (ii) *Tentukan garis tengah dan had-had kawalan bagi purata.*
- (iii) *Tentukan garis tengah dan had-had kawalan bagi julat.*
- (iv) *Lukis carta \bar{X} dan carta R .*
- (v) *Jika terdapat sebarang data diluar kawalan dan dianggap disebabkan oleh kes khas, lakukan ubahsuai kepada carta.*

Table 4 / *Jadual 4*

<i>Group / Kumpulan</i>	<i>Measurements / Pengukuran</i>				
1	15.1	14.9	15.3	15.4	14.8
2	14.8	15.3	14.9	15.0	12.5
3	15.2	12.0	14.6	14.8	14.4
4	15.0	14.6	14.6	14.9	14.4
5	14.9	14.7	14.2	14.2	15.0
6	14.5	14.9	14.9	16.1	15.1
7	13.8	14.3	14.3	14.6	14.5
8	15.2	14.5	14.7	14.8	14.8
9	14.9	14.8	14.8	15.0	16.9
10	15.3	13.1	15.0	14.4	14.7

(60 marks/*markah*)