

SULIT



**UNIVERSITI TUN HUSSEIN ONN MALAYSIA**

**PEPERIKSAAN AKHIR  
SEMESTER II  
SESI 2013/2014**

NAMA KURSUS : KEJURUTERAAN INDUSTRI  
KOD KURSUS : DAM 31802  
PROGRAM : 3 DAM  
TARIKH PEPERIKSAAN : JUN 2014  
JANGKA MASA : 2 JAM 30 MINIT  
ARAHAN : JAWAB EMPAT (4) SOALAN  
SAHAJA DARIPADA ENAM (6)  
SOALAN.

KERTAS SOALAN INI MENGANDUNGI **LIMA BELAS (15)** MUKA SURAT

SULIT

## SOALAN DI DALAM BAHASA MELAYU

- S1** (a) Nyatakan definisi 'ramalan' berdasarkan konsep kejuruteraan industri. (2 markah)
- (b) Terangkan konsep pendekatan ramalan di bawah:
- (i) Kaedah kualitatif (4 markah)
- (ii) Kaedah kuantitatif (4 markah)
- (c) Ramalan merupakan suatu kaedah menganggarkan kuantiti permintaan pelanggan pada masa hadapan terhadap sesuatu produk yang perlu disediakan. Berdasarkan Jadual **S1(c)**, kira nilai ramalan permintaan pelanggan bagi bulan Oktober menggunakan kaedah-kaedah seperti di maklumat (i)-(iv) sahaja.
- (i) Kaedah naif. (2 markah)
- (ii) 4-tempoh purata pergerakan mudah. (2 markah)
- (iii) 3-tempoh purata pergerakan berpemberat dengan nilai pemberat ialah 0.5, 0.3 dan 0.2 (nilai tertinggi bagi masa terkini). (2 markah)
- (iv) Pelicinan eksponan mudah dengan  $\alpha = 0.3$ . Anggapkan ramalan bagi bulan Julai ialah 20. (4 markah)
- (v) Menggunakan kaedah regresi, kirakan pula ramalan bagi kadar permintaan pada bulan Disember berikutnya. (5 markah)
- S2** (a) Nyatakan definisi bagi 'kualiti'. (2 markah)
- (b) Terangkan secara ringkas konsep bagi:
- (i) Pemeriksaan (2 markah)
- (ii) Kawalan Kualiti (2 markah)
- (iii) Jaminan Kualiti (2 markah)

- (c) Data di Jadual **S2(c)** menunjukkan sebanyak 20 sub-kumpulan sampel bersaiz  $n=4$  diambil daripada proses pembungkusan rempah kari.
- (i) Sediakan Carta X-bar dan Carta R bagi proses ini. Rujuk Jadual **S2(c)(i)** bagi menjawab soalan. (15 markah)
- (ii) Adakah proses ini berada dalam kawalan? Nyatakan sebab kepada jawapan anda. (2 markah)
- S3** (a) Bayangkan anda merupakan jurutera yang bertanggungjawab merekabentuk meja lukisan kejuruteraan bercirikan konsep ergonomik. Senaraikan **empat (4)** parameter kritikal yang perlu dititikberatkan dalam penghasilan produk ini. (4 markah)
- (b) Terangkan secara ringkas konsep *Just-in-Time* (JIT) dan tujuan perlaksanaannya di lini pengeluaran. (4 markah)
- (c) Syarikat Fast Turbo menerima permintaan 50,000 kuantiti setahun bagi penghasilan kereta permainan. Syarikat menghasilkan permainan ini pada kadar 1,000 sehari. Kereta permainan ini dipasang secara berterusan dalam setahun. Kos pegangan ialah RM1 per unit per tahun. Kos setup untuk pengeluaran ialah RM50. Syarikat beroperasi 240 hari setahun. Kirakan:
- (i) Kuantiti pesanan optimum (4 markah)
- (ii) Jumlah kos minimum tahunan bagi kos pegangan dan kos setup (4 markah)
- (iii) Kitaran masa bagi kuantiti pesanan optimum (2 markah)
- (d) Menggunakan Peraturan Johnson, tentukan jumlah masa siap dan masa melahu bagi Proses 1 dan Proses 2 seperti yang ditunjukkan dalam Jadual **S3(d)**. (7 markah)
- S4** (a) Senaraikan **empat (4)** kaedah dalam penilaian lokasi alternatif. (4 markah)
- (b) Susunatur fasiliti amat penting di sesebuah industri pengeluaran produk. Terangkan secara ringkas **tiga (3)** jenis susunatur fasiliti asas. (4 markah)

- (c) En. Zul merupakan seorang pengurus pengeluaran di sebuah kilang membuat produk elektrik. Beliau bercadang membangunkan sebuah Jabatan Penyelenggaraan Mesin di lokasi paling strategik antara 8 buah mesin yang perlu diselenggara seperti yang ditunjukkan dalam Jadual S4(c).
- (i) Tentukan lokasi strategik tersebut yang dapat meminimalkan jarak maksimum(Minimax) antara Jabatan Penyelenggaraan Mesin dengan kesemua mesin ini. (6 markah)
- (ii) Tunjukkan nama-nama mesin yang mempunyai jarak maksimum terhadap lokasi jabatan ini. Jawapan anda perlu disertakan dengan contoh pengiraan yang jelas. (6 markah)
- S5** (a) Namakan **empat (4)** sebab mengapa perlunya seseorang jurutera melaksanakan Analisis Kaedah? (4 markah)
- (b) Terangkan secara ringkas **tiga (3)** perkara penting yang perlu ditekankan dalam pembangunan Kaedah Kerja. (6 markah)
- (c) Satu kajian kerja telah dilakukan bagi proses melibatkan 6 elemen kerja secara berturutan. Jadual S5(c) memaparkan kitaran masa proses dalam minit menggunakan jam randik secara teknik 'snap back'. Gaji seorang pekerja adalah RM2,000 sebulan. Elaun keletihan adalah 5%, elaun kelewatan 6% dan elaun kelegaan diri 7%.
- (i) Kira jumlah masa piawai bagi keseluruhan proses pemasangan tersebut. (5 markah)
- (ii) Sekiranya permintaan 10,000 unit sebulan, anggarkan bilangan operator yang diperlukan untuk proses pemasangan tersebut. Syarikat beroperasi 20 hari sebulan dengan hanya 8 jam per shif sehari. (5 markah)
- (iii) Sekiranya syarikat bercadang mengambil 50 orang pekerja, kirakan kos kerja lebih masa per hari bagi setiap pekerja untuk pengeluaran 10,000 unit sebulan. Andaikan hanya 80% pekerja yang boleh melakukan kerja lebih masa dan kadar bayaran gaji lebih masa adalah 2 kali ganda gaji normal. (5 markah)

- S6 (a) Senaraikan **lima (5)** faedah pelaksanaan *Six Sigma* di industri perkilangan. (5 markah)
- (b) Terangkan secara ringkas terminologi ergonomik di bawah:
- (i) Fisiologi kerja (2 markah)
  - (ii) Biomekanik (2 markah)
  - (iii) Antropometrik (2 markah)
- (c) Proton Holdings Berhad mencadangkan tiga tempat – A, B and C – untuk pembinaan kilang baru untuk pemasangan model baru Proton Alpha Hybrid. Matlamatnya untuk menentukan lokasi yang mempunyai kos minimum, dimana kos dihitung melalui “*annual fixed plus variable costs*” . Proton Holdings Berhad telah mengumpulkan maklumat seperti Jadual 1 berikut:

**Jadual 1: Annual fixed and variables costs**

<i>Site</i>	<i>Annual Fixed Costs (RM)</i>	<i>Variables Costs per Car Produced (RM)</i>
A	10,000,000	2,500
B	20,000,000	2,000
C	25,000,000	1,000

Pihak syarikat mengetahui ia akan mengeluarkan antara 0 hingga 60,000 Proton Alpha Hybrid di plan barunya setiap tahun, tetapi, setakat itu sahaja maklumat mengenai plan pengeluaran yang diketahui.

- (i) Ramalkan pengeluaran *volume*, V, jika lokasi C dicadangkan. (6 markah)
- (ii) Apakah *volume* yang menunjukkan lokasi A adalah optimal, kirakan? (5 markah)
- (iii) Pada julat manakah *volume* lokasi B optimal? Kenapa? (3 markah)

**-SOALAN TAMAT-**

**SOALAN DI DALAM BAHASA INGGERIS**

- Q1** (a) Define 'forecasting' according to industrial engineering concept. (2 marks)
- (b) Explain the concept of forecasting approach as below:
- (i) Qualitative Method (4 marks)
  - (ii) Quantitative Method (4 marks)
- (c) Forecasting is the method of anticipating customer future demand in order product to be supplied. According to Table **Q1(c)**, calculate forecast value of the demand for month of October using the methods described by (i)-(iv) only.
- (i) Naïve method. (2 marks)
  - (ii) 4-period simple moving average. (2 marks)
  - (iii) 3-period weighted moving average with weightage value of 0.5, 0.3 and 0.2 (highest value for the most recent period). (2 marks)
  - (iv) Simple exponential smoothing with  $\alpha = 0.3$ . Assume the forecast for month of July is 20. (4 marks)
  - (v) Using regression technique, calculate also the forecast demand for month of December. (5 marks)
- Q2** (a) State the definition of 'quality'. (2 marks)
- (b) Describe briefly the concept for:
- (i) Inspection (2 marks)
  - (ii) Quality Control (2 marks)
  - (iii) Quality Assurance (2 marks)

- (c) Data in Table **Q2(c)** shows a sub-group of 20 samples of size  $n = 4$  is taken from curry spicy packing process.
- (i) Prepare the X-bar chart and R chart for this process. Refer to Table **Q2(c)(i)** to answer questions. (15 marks)
- (ii) Is the process in control? State the reason, whether yes or no. (2 marks)

- Q3** (a) Assume that you are an engineer responsible to design an ergonomic engineering table. List down **four (4)** critical parameters need to be taken into account in order to realise the product. (4 marks)
- (b) Explain briefly the concept of Just-in-Time (JIT) and its implementation purpose at lean manufacturing production. (4 marks)
- (c) Fast Turbo company received 50,000 demands a year for production quantities of their car toys. Company produces these toys at a rate of 1,000 a day. The toys are installed on a continuous basis in a year. Holding cost is RM1 per unit per year. Setup cost for production is RM50. The company operates 240 days a year. Calculate:
- (i) Optimal order quantity (4 marks)
- (ii) Minimum total annual cost for holding and setup cost (4 marks)
- (iii) Cycle time for optimal order quantity (2 marks)
- (d) Using Johnson's Rule, determine the total completion time and idle time for Process 1 and Process 2 as shown in Table **Q3(d)**. (7 marks)

- Q4** (a) List down **four (4)** techniques to evaluate location alternatives. (4 marks)
- (b) Facility layout is important in product manufacturing industries. Explain briefly **three (3)** types of basic facility layout. (6 marks)
- (c) Mr.Zul is operation manager at electric product manufacturing factory. He planned to establish Machine Maintenance Department at strategic location between 8 machines which have to get maintenance regularly as shown in Table **Q4(c)**.
- (i) Determine the strategic location that can minimize the maximum (Minimax) distance between the Machine Maintenance Department and these machines. (7 marks)
- (ii) Show name of the machines which has maximum distance to this department's location. Your answer must be supported by clear calculation. (8 marks)
- Q5** (a) Name out **four (4)** reasons why engineer conducting Method Analysis? (4 marks)
- (b) Briefly explain **three (3)** important points which should be emphasized during Work Method development. (6 marks)
- (c) A work study was conducted for a process which involves 6 work elements consecutively. Table **Q5(c)** show the process cycle time in minutes, taken by stop watch using 'snap back' technique. A worker's salary is RM2,000 per month. The allowances given are 5% for fatigue, 6% for delay, and 7% for personal relief.
- (i) Compute the standard time for the whole assembly process. (5 marks)
- (ii) If the demand is 10,000 units per month, estimate the number of operators required for the assembly process. The company is operating 20 days per month and a single 8 hour shift per day. (5 marks)
- (iii) If the company willing to employ 50 workers, compute the over time cost per day for each worker for the production of 10,000 units per month. Assume only 80% workers are available for overtime and the overtime pay rate is 2 times of the normal wage. (5 marks)



- Q6** (a) List down **five (5)** benefits of Six Sigma implementation in factory industry. (5 marks)
- (b) Briefly explain the following terminology related to ergonomic:
- (i) Work Physiology (2 marks)
  - (ii) Biomechanics (2 marks)
  - (iii) Anthropometric (2 marks)
- (c) Proton Holdings Berhad is considering three sites – A, B and C – at which to locate a factory to build its new-model automobile, the Proton Alpha Hybrid. The goal is locate at a minimum-cost site, where cost is measured by the annual fixed plus variable costs of production. Proton Holdings Berhad has gathered the following data in Table 1 below:

**Table 1: Annual fixed and variables costs**

Site	Annual Fixed Costs (RM)	Variables Costs per Car Produced (RM)
A	10,000,000	2,500
B	20,000,000	2,000
C	25,000,000	1,000

The firm knows it will produce between 0 and 60,000 Proton Alpha Hybrid at the new plant each year, but, thus far, that is the extent of its knowledge about production plans.

- (i) Predict volume,  $V$ , of production, if any, is site C a recommended site? (6 marks)
- (ii) What volume indicates site A is optimal, compute? (5 marks)
- (iii) Over what range of volume is site B optimal? Why? (3 marks)

**- END OF QUESTION -**

**PEPERIKSAAAN AKHIR**  
**FINAL EXAMINATION**SEMESTER / SESI : SEM.2 2013/2014  
*SEMESTER / SESSION*PROGRAM : 3 DAM  
*PROGRAMME*KURSUS : KEJURUTERAAN INDUSTRI  
*COURSE*KOD KURSUS : DAM31802  
*COURSE CODE***JADUAL S1(c) / TABLE Q1(c): Data Permintaan Pelanggan**

<b>Bulan</b>	<b>Permintaan</b>
Jan	17
Feb	19
Mac	18
April	15
Mei	20
Jun	18
Julai	22
Aug	20
Sep	23

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**JADUAL S2(c) / TABLE Q2(c): Berat Bungkus Rempah Kari**

No. Sub Kumpulan	Berat bungkus (kg)			
	X <sub>1</sub>	X <sub>2</sub>	X <sub>3</sub>	X <sub>4</sub>
1	2.1	3.1	2.2	4.1
2	3.2	2	3.8	4.6
3	2.1	3.7	2.1	2.5
4	2	2.6	3	3
5	2.1	2.8	3.3	3.2
6	2	4.5	4.6	1
7	2	5	3.8	3
8	2.9	1.8	3.6	2.9
9	3.8	3.8	4.4	1.9
10	3.5	3.6	2.5	2.8
11	3.7	3.2	1.9	4.9
12	4.9	4	1.6	7
13	3.6	7	4	3.2
14	2.9	1.8	3	4.4
15	3.4	2	3.1	2.6
16	2.5	2.6	3.8	1.5
17	3.6	3.5	2	2.4
18	3.3	2.1	2.2	2.2
19	1.8	4.1	3.8	4
20	3.6	3.6	2.5	2.5

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**JADUAL S2(c)(i) / TABLE Q2(c)(i)**

Factors for Computing Central Lines and  $3\sigma$  Control Limits for  $\bar{X}$ ,  $s$  and  $R$  Charts.

OBSERVATIONS IN SAMPLE, $n$	CHART FOR AVERAGES			CHART FOR STANDARD DEVIATIONS				CHART FOR RANGES						
	FACTORS FOR CONTROL LIMITS			FACTOR FOR CENTRAL LINE	FACTORS FOR CONTROL LIMITS				FACTOR FOR CENTRAL LINE	FACTORS FOR CONTROL LIMITS				
	$A$	$A_2$	$A_3$	$c_4$	$B_3$	$B_4$	$B_5$	$B_6$	$d_2$	$d_1$	$D_1$	$D_2$	$D_3$	$D_4$
2	2.121	1.880	2.659	0.7979	0	3.267	0	2.606	1.128	0.853	0	3.686	0	3.267
3	1.732	1.023	1.954	0.8862	0	2.568	0	2.276	1.693	0.888	0	4.358	0	2.574
4	1.500	0.729	1.628	0.9213	0	2.266	0	2.088	2.059	0.880	0	4.698	0	2.282
5	1.342	0.577	1.427	0.9400	0	2.089	0	1.964	2.326	0.864	0	4.918	0	2.114
6	1.225	0.483	1.287	0.9515	0.030	1.970	0.029	1.874	2.534	0.848	0	5.078	0	2.004
7	1.134	0.419	1.182	0.9594	0.118	1.882	0.113	1.806	2.704	0.833	0.204	5.204	0.076	1.924
8	1.061	0.373	1.099	0.9650	0.185	1.815	0.179	1.751	2.847	0.820	0.388	5.306	0.136	1.864
9	1.000	0.337	1.032	0.9693	0.239	1.761	0.232	1.707	2.970	0.808	0.547	5.393	0.184	1.816
10	0.949	0.308	0.975	0.9727	0.284	1.716	0.276	1.669	3.078	0.797	0.687	5.469	0.223	1.777
11	0.905	0.285	0.927	0.9754	0.321	1.679	0.313	1.637	3.173	0.787	0.811	5.535	0.256	1.744
12	0.866	0.266	0.886	0.9776	0.354	1.646	0.346	1.610	3.258	0.778	0.922	5.594	0.283	1.717
13	0.832	0.249	0.850	0.9794	0.382	1.618	0.374	1.585	3.336	0.770	1.025	5.647	0.307	1.693
14	0.802	0.235	0.817	0.9810	0.406	1.594	0.399	1.563	3.407	0.763	1.118	5.696	0.328	1.672
15	0.775	0.223	0.789	0.9823	0.428	1.572	0.421	1.544	3.472	0.756	1.203	5.741	0.347	1.653
16	0.750	0.212	0.763	0.9835	0.448	1.552	0.440	1.526	3.532	0.750	1.282	5.782	0.363	1.637
17	0.728	0.203	0.739	0.9845	0.466	1.534	0.458	1.511	3.588	0.744	1.356	5.820	0.378	1.622
18	0.707	0.194	0.718	0.9854	0.482	1.518	0.475	1.496	3.640	0.739	1.424	5.856	0.391	1.608
19	0.688	0.187	0.698	0.9862	0.497	1.503	0.490	1.483	3.689	0.734	1.487	5.891	0.403	1.597
20	0.671	0.180	0.680	0.9869	0.510	1.490	0.504	1.470	3.735	0.729	1.549	5.921	0.415	1.585

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**JADUAL S3(d) / TABLE Q3(d): Masa memproses bagi setiap kerja (minit)**

	Kerja									
	A	B	C	D	E	F	G	H	I	J
<b>Proses 1</b>	1	5	8	3	9	4	7	2	4	9
<b>Proses 2</b>	8	3	1	2	8	6	7	2	4	1

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**JADUAL S4(c) / TABLE Q4(c): Lokasi kedudukan mesin yang perlu diselenggara**

<b>Nama Mesin</b>	<b>Lokasi kedudukan</b>
P1	(0,0)
P2	(4,6)
P3	(8,2)
P4	(10,4)
P5	(4,8)
P6	(2,4)
P7	(6,4)
P8	(8,8)

**JADUAL S5(c) / TABLE Q5(c): Maklumat kajian kerja**

<b>Elemen Kerja</b>	<b>Kaedah Pemasangan</b>	<b>Rating</b>	<b>Kitaran Masa (minit)</b>				
			<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
A	Manual	90%	5	4.3	4.5	4.8	4.6
B	Manual	85%	12.3	13.4	10.0	14.5	13.0
C	Automatik		4	4	4	4	4
D	Manual	110%	8.9	7.7	9.0	9.3	8.6
E	Manual	115%	15.8	14.6	17.3	18.0	16.7
F	Automatik		6	6	6	6	6

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**Rumus/Formula:**

$$f(x, y) = \sum_{i=1}^n w_i (|x - a_i| + |y - b_i|) \longrightarrow \text{Minisum formula}$$

$$f(x, y) = \max_{1 \leq i \leq n} (|x - a_i| + |y - b_i|)$$

$$\text{First point : } (x_1, y_1) = 0.5 (C_1 - C_3, C_1 + C_3 + C_5)$$

$$\text{Second point : } (x_2, y_2) = 0.5 (C_2 - C_4, C_2 + C_4 - C_5)$$

Minimax formula

$$a = \frac{\sum y - b \sum x}{n} \quad b = \frac{n \sum xy - \sum x \sum y}{n \sum x^2 - (\sum x)^2} \longrightarrow \text{Regression formula}$$

$$Q^* = \sqrt{\frac{2DS}{H}} \quad TC = \frac{D}{Q} S + \frac{Q^*}{2} H$$

$$Q^* = \sqrt{\frac{2DS}{H(1-d/p)}} \quad TC = \frac{D}{Q} S + \frac{Q^*}{2} H * (1-d/p)$$

$$d = \frac{D}{\text{working days / year}}$$