UTHM
Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2016/2017

COURSE NAME	:	INDUSTRIAL ENGINEERING & QUALITY MANAGEMENT
COURSE CODE	:	DAJ 21203
PROGRAMME CODE	:	DAJ
EXAMINATION DATE	:	JUNE 2017
DURATION	:	2 HOURS 30 MINUTES
INSTRUCTION	:	PART A ANSWER **ALL** QUESTIONS
		PART B ANSWER **TWO (2)** QUESTIONS ONLY.

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THIS QUESTION PAPER CONSISTS OF **TWELVE (12)** PAGES

BAHASA MELAYU

BAHAGIAN A :

S1   (a)   Nyatakan definisi 'ramalan' berdasarkan konsep kejuruteraan industri.

(4 markah)

(b)   Terangkan kenapa ramalan itu penting untuk sesuatu perniagaan.

(5 markah)

(c)   Ramalan merupakan suatu kaedah menganggarkan kuantiti permintaan pelanggan pada masa hadapan terhadap sesuatu produk yang perlu disediakan. Berdasarkan **Jadual 1** kirakan:.

(i)   ramalan bulan Oktober menggunakan 4-tempoh purata pergerakan mudah,

(2 markah)

(ii)   ramalan bulan Oktober menggunakan 3-tempoh purata pergerakan berpemberat dengan nilai pemberat ialah 0.5, 0.3 dan 0.2 (nilai tertinggi bagi masa terkini)

(3 markah)

(iii)   ramalan bulan Oktober menggunakan pelicinan eksponan mudah dengan $\alpha = 0.3$. Anggapkan ramalan bagi bulan Julai ialah 22,

(5 markah)

(iv)   jadikan ramalan dari jawapan S1(c)(iii) sebagai permintaan sebenar, bina semula ramalan dengan menggunakan kaedah regresi untuk mengetahui kadar permintaan pada bulan Disember berikutnya.

(6 markah)

S2   (a)   Kajian persampelan kerja yang diadakan di sebuah loji salutan logam telah menghasilkan data pada **Jadual 2**. Waktu operasi bagi loji tersebut adalah 8 jam/hari, 6 hari/minggu, dan 4 minggu/bulan.

(i)   kirakan masa piawai dalam min/unit untuk proses salutan tersebut,

(5 markah)

(ii)   jika jumlah permintaan untuk loji tersebut ialah 15,000 unit sebulan, kenal pastikan tempoh kerja lebih masa sehari yang mesti diatur untuk memenuhi permintaan pelanggan. Hanya 80 % pekerja yang rela untuk bekerja lebih masa dan kerja lebih masa diatur pada setiap hari bekerja.

(10 markah)

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(b) Terangkan secara ringkas faktor ergonomik yang perlu ada pada produk dalam usaha untuk melindungi pengguna semasa menggunakanya.

(5 markah)

(c) Nyatakan faedah rekabentuk ergonomik terhadap orang kurang upaya.

(5 markah)

BAHAGIAN B:

S3 (a) Terangkan terminologi kos inventori di bawah:

    (i)   Kos Pesanan,

(2 markah)

    (ii)   Kos Persediaan.

(2 markah)

(b) Syarikat Sonic Computer menggunakan 1,000 transistor setiap bulan bagi proses pemasangan komputer mereka. Kos seunit transistor ialah $10, dan kos pegangan inventori seunit bagi masa setahun ialah $3. Kos pesanan ialah $30 per pesanan dan syarikat ini beroperasi 200 hari bekerja setahun. Tentukan:

    (i)   Kuantiti pesanan optimum,

(2 markah)

    (ii)   Anggaran bilangan pesanan setiap tahun,

(2 markah)

    (iii)   Anggaran sela masa antara pesanan.

(2 markah)

(c) **Jadual 3** menunjukkan urutan tugas di Syarikat ABC. Berdasarkan jadual yang diberi, bina jadual *simple sequencing rules* mengikut kaedah FCFS, DDATE dan SPT tunjukkan pengiraan anda. Seterusnya lengkapkan **Jadual 4** *simple sequencing rules summary* untuk menunjukkan perbezaan antara ketiga-tiga kaedah diatas.

(15 markah)

S4 (a) Nyatakan definisi bagi 'kualiti'.

(2 markah)

(b) Terangkan secara ringkas konsep bagi:

    (i)   Pemeriksaan,

(2 markah)

    (ii)   Kawalan Kualiti,

(2 markah)

3

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(iii) Jaminan Kualiti.

(2 markah)

(c) Data di **Jadual 5** 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 6** bagi menjawab soalan.

(12 markah)

(ii) Adakah proses ini berada dalam kawalan? Huraikan sebab kepada jawapan anda.

(5 markah)

S5 (a) Senaraikan **empat (4)** teknik penentuan lokasi alternatif.

(4 markah)

(b) Susunatur fasiliti amat penting di sesebuah industri pengeluaran produk. Terangkan secara ringkas **tiga (3)** jenis susunatur fasiliti asas.

(6 markah)

(c) Yonex Sdn. Bhd. sedang merancang membina gudang baru untuk kegunaan pembekal di kawasan utara Malaysia. Beberapa lokasi telah dikenalpasti, terutamanya di Alor Setar, Sungai Petani, Lunas dan Kulim. Untuk setiap lokasi,kos tetap tahunan (sewa, peralatan, dan insuran) dan purata kos berubah bagi setiap penghantaran (kerja, pengangkutan, dan utiliti) telah disenaraikan di dalam **Jadual 7**.Unjuran jualan dijajar pada 20,000 penghantaran setiap bulan;

(i) plotkan garisan kos keseluruhan untuk kesemua lokasi pada satu graf,

(9 markah)

(ii) kenalpasti jajaran jualan untuk pelbagai alternatif yang menghasilkan kos terendah,

(4 markah)

(iii) jika jangkaan jumlah jualan pada lokasi terpilih adalah 10,000 penghantaran setahun, tentukan lokasi yang memberikan kos keseluruhan terendah berpandukan daripada graf.

(2 markah)

- SOALAN TAMAT -

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PART A :

Q1 (a) Define 'forecasting' according to industrial engineering concept.

(4 marks)

(b) Explain why forecasting is important in the business.

(5 marks)

(c) Forecasting is the method of anticipating customer future demand in order product to be supplied. According to **Table 1** calculate:

(i) October forecasting by using 4-period simple moving average,

(2 marks)

(ii) October forecasting by using 3-period weighted moving average with weightage value of 0.5, 0.3 and 0.2 (highest value for the most recent period)

(3 marks)

(iii) October forecasting by using Simple exponential smoothing with $\alpha = 0.3$. Assume the forecast for month of July is 22,

(5 marks)

(iv) use forecast result from Q1(c)(iii) as actual demand, rebuild the forecast by using regression technique to determine the demand for month of December.

(6 marks)

Q2 (a) A work sampling study conducted at a metal coating plant has resulted to the data in **Table 2.** The plant operation time is 8 hours/day, 6 days/week, 4 weeks/month.

(i) compute the standard time in min/unit for the coating process,

(5 marks)

(ii) if the total demand for the plant is 15,000 units per month, identify the overtime period per day that must be arranged to meet the customers demand. Only 80% employees are willing to work overtime and the overtime is arranged on every working day.

(10 marks)

(b) Briefly explain the ergonomic factors that a product should have in order to protect the consumer when using it.

(5 marks)

(c) State the benefits of ergonomics design over disabled people.

(5 marks)

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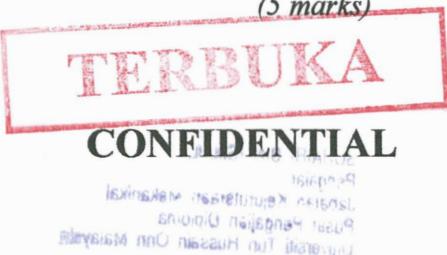
PART B :

Q3 (a) Explain inventory cost terminology below:

(i) Ordering Cost,

(2 marks)

(ii) Setup Cost,

(2 marks)

(b) Sonic Computer Company uses 1,000 transistors each month for its computers assembly. The unit cost of each transistor is $10, and the cost of holding one transistor in inventory for a year is $3. Ordering cost is $30 per order. The company operates 200 working days per year. Identify:

(i) The optimal order quantity,

(2 marks)

(ii) The expected number of orders placed each year,

(2 marks)

(iii) The expected time between orders.

(2 marks)

(c) **Table 3** indicate jobs sequence at ABC Company. Based on the table given, construct simple sequencing rules table by using FCFS, DDATE and SPT method. Show your calculation and then complete **Table 4** simple sequencing rules summary to show the differences among above method.

(15 marks)

Q4 (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)

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(c)   Data in **Table 5** 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 6** to answer questions,

(12 marks)

    (ii)   is the process in control? Elobrate the reason, whether yes or no.

(5 marks)

Q5   (a)   List down **four (4)** techniques in evaluating alternative locations.

(4 marks).

(b)   Facility layout is important in product manufacturing industries. Explain briefly **three (3)** types of basic facility layout.

(6 marks)

(c)   Yonex Co., Ltd is planning a new warehouse to serve suppliers in the northern region of Malaysia. Several locations have been identified, particularly in Alor Setar, Sungai Petani, Lunas and Kulim. For each location, annual fixed costs (rent, equipment, and insurance) and average variable costs per shipment (labor, transportation, and utilities) are listed in **Table 7**. Sales projections range 20,000 shipments per month;

    (i)   plot the total cost lines for all the locations on a single graph,

(9 marks)

    (ii)   identify the range of sales for various alternatives that yield the lowest cost,

(4 marks)

    (iii)   if the expected volume of sales at the selected location is to be 10,000 shipments per year, determine the location that would provide the lowest total cost by refer from the graph.

(2 marks)

- END OF QUESTION -

Jadual 1 / Table 1: Data Permintaan Pelanggan

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

Jadual 2/ Table 2: 6-Day Work Sampling Study Data

Item	Data
Total observation period	6 days
Observation time per day	8 hours
Plant in operations during 6-day study	270 observations
Plant idle during 6-day study	18 observations
Average daily output	520 units/day
Rating	90%
Allowances	15%

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COURSE NAME   PENGURUSAN KUALITI   *COURSE CODE*

Jadual 3/ Table 3

Job	Job work (processing) time (Days)	Job Due Date
A	5	7
B	1	5
C	7	17
D	2	14
E	8	22

Jadual 4/ Table 4

Rule	Average Completion Time	Average Tardiness	No. of Jobs Tardy	Maximum Tardiness
FCFS				
DDATE				
SPT				

Nota: Lengkapkan **Jadual 4/ Table 4** diatas dan lampirkan bersama-sama skrip

jawapan.

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COURSE NAME	PENGURUSAN KUALITI	*COURSE CODE*	

Jadual 5 / Table 5: Berat Bungkusan Rempah

No. Sub Kumpulan	Berat bungkusan (kg)			
	X_1	X_2	X_3	X_4
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 6 / Table 6:

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

OBSERVATIONS IN SAMPLE, n	CHART FOR AVERAGES FACTORS FOR CONTROL LIMITS			CHART FOR STANDARD DEVIATIONS FACTOR FOR CENTRAL LINE	FACTORS FOR CONTROL LIMITS				CHART FOR RANGES 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_3	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 7 / Table 7

Location	Annual Fixed Costs (RM)	Variables Costs per Shipment (RM)
Alor Setar	600,000	30
Sungai Petani	300,000	38
Lunas	150,000	62
Kulim	500,000	24

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Rumus/Formula:

$$TC = FC + VC(Q)$$

$$f(x,y) = \sum_{i=1}^{n} w_i \left(|x - a_i| - |y - b_i| \right) \rightarrow Minisum\ formula$$

$$f(x,y) = max(|x - a_i| + |y - b_i|)$$

$$First\ point: (x_1, y_1) = 0.5(c_1 - c_2, c_1 + c_3 + c_5)$$

$$Second\ point: (x_2, y_2) = 0.5(c_2 - c_4, c_2 + c_4 - c_5)$$

$\left. \right\}$ *Minimax formula*

$$Normal\ time = \frac{(Total\ observation\ time)x(Productive)x(Rating)}{(1 - Allowance\ factor)}$$

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

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

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

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