UNIVERSITI TUN HUSSEIN ONN MALAYSIA

PEPERIKSAAN AKHIR
SEMESTER I
SESI 2015/2016

NAMA KURSUS	:	KEJURUTERAAN INDUSTRI
KOD KURSUS	:	DAM 31802
PROGRAM	:	2 DAM
TARIKH PEPERIKSAAN	:	DECEMBER 2015/ JANUARY 2016
JANGKA MASA	:	2 JAM 30 MINIT
ARAHAN	:	JAWAB **EMPAT (4)** SOALAN SAHAJA.

KERTAS SOALAN INI MENGANDUNGI **ENAM BELAS (16)** MUKA SURAT

BAHASA MELAYU

S1 (a) Bincangkan **empat (4)** kebaikan egronomik.

(4 markah)

(b) Bincangkan objektif bagi kaedah minisum dan kaedah pengangkutan di dalam menilai pilihan lokasi.

(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 S1(c)**.Unjuran jualan dijajar pada 20,000 penghantaran setiap bulan;

(i) plot 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)

S2 (a) Senaraikan **empat (4)** keadaan kerja yang perlu dipertimbangkan untuk kajian pengukuran kerja.

(4 markah)

(b) Terdapat **tiga (3)** jenis kelonggaran yang berlaku semasa tempoh bekerja, iaitu elaun masa peribadi, elaun kelewatan, dan elaun kelesuan. Terangkan setiap daripada elaun ini.

(6 markah)

(c) Kajian persampelan kerja yang diadakan di sebuah loji salutan logam telah menghasilkan data pada **Jadual S2(c)**. 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,

(6 markah)

(ii) jika jumlah permintaan untuk loji tersebut ialah 15,000 unit sebulan, tentukan kekurangan dan 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.

(9 markah)

S3 (a) Bincangkan **empat (4)** tujuan Pengurusan Kualiti Menyeluruh (TQM).

(4 markah)

(b) Bincangkan **empat (4)** tujuan Carta Kawalan.

(4 markah)

(c) Data di **Jadual S3(c)** menunjukkan 25 sub-kumpulan diameter aci dengan n = 5, diambil daripada proses larik;

(i) hitung dan lengkapkan **Jadual S3(c)** ini,

(4 markah)

(ii) sediakan Carta X-bar dan Carta R bagi proses ini. Rujuk **Jadual S3(c)(i)** dan gunakan **Rajah S3(c)(ii)** dan **Rajah S3(c)(iii)** untuk menjawab soalan.

(13 markah)

S4 (a) Bagi memenuhi fungsi inventori, firma mengekalkan empat jenis inventori senaraikan **tiga (3)** daripadanya.

(3 markah)

(b) Setelah memilih proses pengeluaran, untuk memenuhi permintaan pengurus perlu menentukan kapasiti, jelaskan kapasiti.

(3 markah)

(c) Pemilik pengeluar minyak pelincir berprestasi tinggi ternama mempertimbangkan untuk mengembangkan lagi perniagaan dengan meningkatkan bilangan jurujual. Data menunjukkan jualan sebenar bagi enam tahun yang lepas seperti ditunjukkan pada **Jadual S4(c)**. Pihak syarikat bercadang untuk menambah jurujual kepada 20 orang pada tahun depan;

(i) tentukan ramalan jangkaan baru jualan mengunakan kaedah *Regressi,*

(10 markah)

(ii) bagi menghasilkan minyak pelincir, minyak mentah perlu melalui 3 proses iaitu *sedimentation, filtering* dan *additives,* kadar skrap untuk setiap proses masing-masing ialah 3%, 2.5% dan 1%. Kirakan minyak mentah yang perlu dibeli setahun bagi memenuhi ramalan tersebut.

(9 markah)

$$m = \frac{n\sum xy - \sum x \sum y}{n\sum x^2 - \left(\sum x\right)^2} \qquad c = \frac{\sum y - m\sum x}{n}$$

5 (a) Senaraikan **tiga (3)** objektif penjadualan.

(3 markah)

(b) Sebuah syarikat pembuatan mempunyai aturan pemasangan yang terdiri daripada 3 mesin dan 4 jenis pekerjaan seperti ditunjukkan dalam **Jadual S5(b)**. Pengurus pengeluaran mempunyai dua urutan pilihan iaitu J4-J1-J3-J2 dan J3-J1-J2-J4. Tentukan urutan kerja yang lebih baik dan nyatakan sebab pemilihan urutan tersebut.

(7 markah)

(c) **Rajah S5(c)** menunjukkan struktur produk A1. Maklumat permintaan pelanggan dan status inventori bagi setiap item adalah ditunjukkan dalam **Jadual S5(c)(i)** dan **Jadual S5(c)(ii)**. Sediakan '*material requirement planning*' (MRP) bagi item G dengan FOQ = 400 dan stok keselamatan = 100. Produk A1 mempunyai masa yang mendahulu 1 minggu. Isikan maklumat berkaitan dalam **Jadual S5(c)(iii)** dan sertakannya sekali dengan skrip jawapan anda.

(15 markah)

- SOALAN TAMAT -

ENGLISH

Q1 *(a) Discuss **four (4)** benefits of ergonomics.*

(4 marks)

(b) Discuss the objective of minisum method and transportation method in evaluating location alternatives.

(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 Q1(c)**. 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)

Q2 *(a) List down **four (4)** working conditions that need to be considered for work measurement study.*

(4 marks)

*(b) There are **three (3)** type of allowances that happen during working period, which are personal time allowance, delay allowance and fatigue allowance. Explain each of this allowance.*

(6 marks)

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

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

(6 marks)

(ii) if the total demand for the plant is 15,000 units per month, determine the shortage and 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.

(9 marks)

Q3 (a) *Discuss **four (4)** purpose of Total Quality Management (TQM).*

(4 marks)

(b) *Discuss **four (4)** purpose of Control Chart.*

(4 marks)

(c) *Data in **Table Q3(c)** shows a 25 sub-group of shaft diameter with n = 5, taken from turning process;*

(i) *compute and complete the **Table Q3(c)**,*

(4 marks)

(ii) *prepare the X-bar chart and R chart for this process. Refer to **Table Q3(c)(i)** and use **Figure Q3(c)(ii)** and **Figure Q3(c)(iii)** as well to answer the questions.*

(13 marks)

Q4 (a) *To accommodate the function of inventory, firm maintain four types of inventory, list out **three (3)** of it.*

(3 marks)

(b) *After selection of a production process, to accomplish a demand manager need to determine capacity, describe the capacity:*

(3 marks)

(c) *The owner of a well known high performance lubrication oil manufacturer is considering expanding its business by increasing the number of salesman. The data representing the actual sales for the past six years are shown in **Table Q4(c)**. The company intends to increase the number of salesman to 20 for next year;*

(i) *forecast the new expected sales by using regression method,*

(10 marks)

(ii) *to manufacture the lubricating oil, crude oil need to go through 3 process it is sedimentation, filtering and additives, scrap rate for the process is 3%, 2.5% and 1% respectively. Calculate the crude oil need to be purchased per year in order to meet the forecast.*

(9 marks)

$$m = \frac{n\sum xy - \sum x \sum y}{n\sum x^2 - \left(\sum x\right)^2} \qquad c = \frac{\sum y - m\sum x}{n}$$

Q5 *(a) List down **three (3)** objectives of scheduling.*

(3 marks)

*(b) A manufacturing company has an assembly line consist of 3 machines and 4 types of jobs as shown in **Table Q5(b)**. The production manager has **two (2)** optional sequences which are J4-J1-J3-J2 and J3-J1-J2-J4. Determine which one is a better job sequence and state a reason of that selection.*

(7 marks)

*(c) **Figure Q5(c)** shows product structure for product A1. Data of customer demands and inventory status for all items are shown in **Table Q5(c)(i)** and **Table Q5(c)(ii)**. Prepare a material requirement planning (MRP) for item G with FOQ = 400 and safety stock =100. Product A1 has a lead time of 1 week. Fill in related information in **Table Q5(c)(iii)** and attach it along with your answer script.*

(15 marks)

- END OF QUESTION -

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Jadual S1(c)/Table Q1(c)

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

Jadual S2(c)/ Table Q2(c)

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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Jadual S3(c)/Table Q3(c)

	Shaft Diameter (cm)						
Sub Group	**X_1**	**X_2**	**X_3**	**X_4**	**X_5**	**X Bar**	**R**
1	1.21	1.31	1.22	1.39	1.32		
2	1.32	1.20	1.38	1.35	1.31		
3	1.21	1.37	1.21	1.25	1.30		
4	1.20	1.26	1.30	1.30	1.27		
5	1.21	1.28	1.33	1.32	1.31		
6	1.38	1.41	1.39	1.41	1.40		
7	1.38	1.35	1.38	1.30	1.36		
8	1.29	1.32	1.36	1.29	1.33		
9	1.38	1.38	1.39	1.39	1.37		
10	1.35	1.36	1.25	1.28	1.30		
11	1.37	1.32	1.25	1.30	1.28		
12	1.34	1.30	1.29	1.37	1.31		
13	1.39	1.38	1.40	1.39	1.38		
14	1.29	1.33	1.30	1.31	1.32		
15	1.34	1.20	1.31	1.26	1.25		
16	1.25	1.26	1.38	1.15	1.20		
17	1.36	1.35	1.20	1.24	1.22		
18	1.33	1.21	1.22	1.22	1.23		
19	1.28	1.35	1.38	1.40	1.36		
20	1.36	1.36	1.25	1.25	1.28		
21	1.35	1.33	1.30	1.31	1.34		
22	1.30	1.32	1.29	1.31	1.28		
23	1.31	1.28	1.34	1.32	1.29		
24	1.33	1.33	1.30	1.30	1.31		
25	1.32	1.29	1.31	1.29	1.30		
				TOTAL =			

Note: Fill in above table and attached together with your answer script.

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Jadual S3(c)(i)/ Table Q3(c)(i)

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

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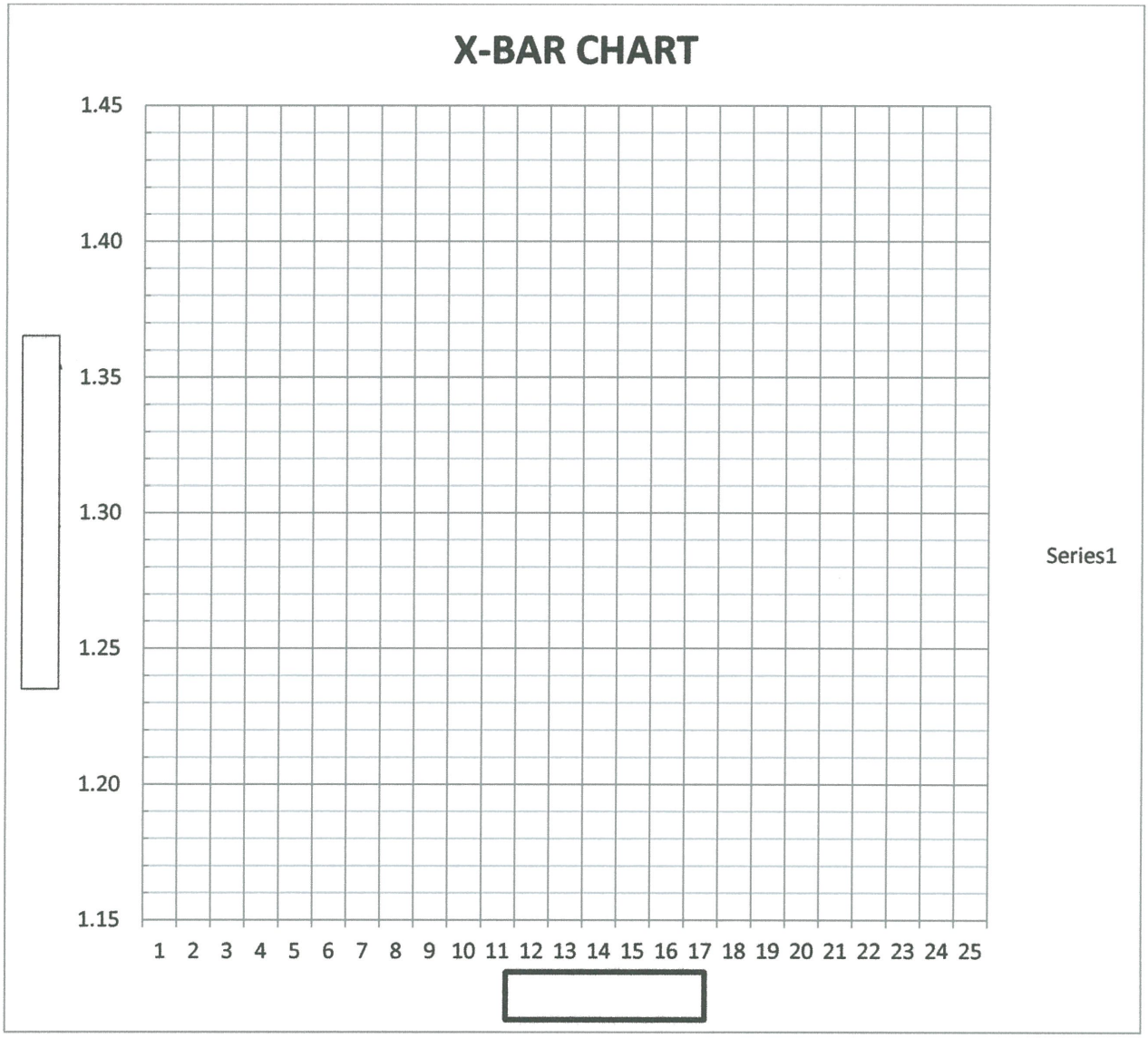

Rajah S3(c)(ii)/ Figure Q3(c)(ii)

 # Fill in above chart and attached together with your answer script.

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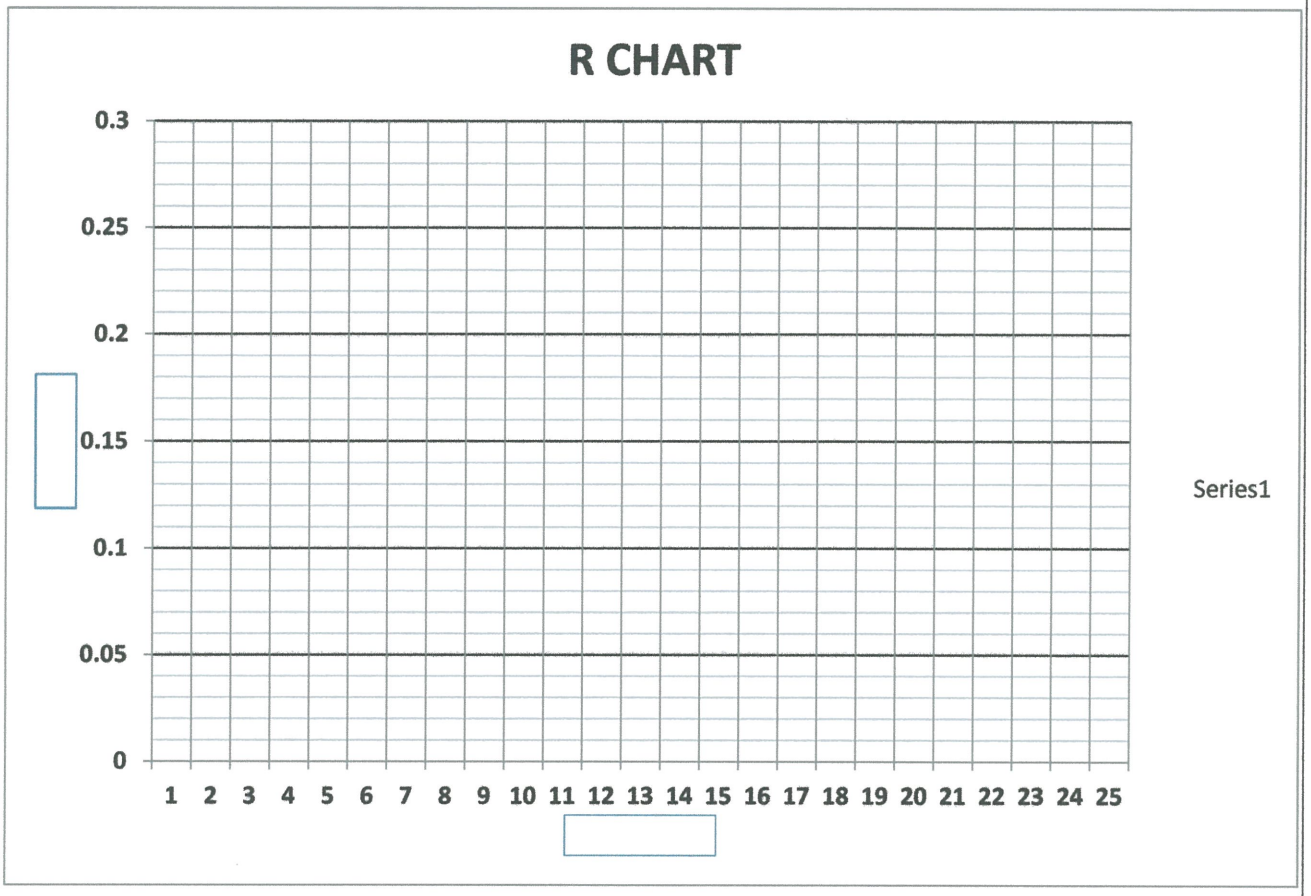

Rajah S3(c)(iii)/ Figure Q3(c)(iii)

 # Fill in above chart and attached together with your answer script

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Jadual S4(c)/ Table Q4(c)

Year	Number of Salesman	Sales Value (00000 Liter)
1	15	2.0
2	16	2.5
3	16	2.7
4	18	3.2
5	17	3.2
6	18	3.5

Jadual S5(b)/ Table Q5(b)

Processing time (Hour)				
Machine	**J1**	**J2**	**J3**	**J4**
A	2	1	7	3
B	6	4	1	2
C	5	3	2	4

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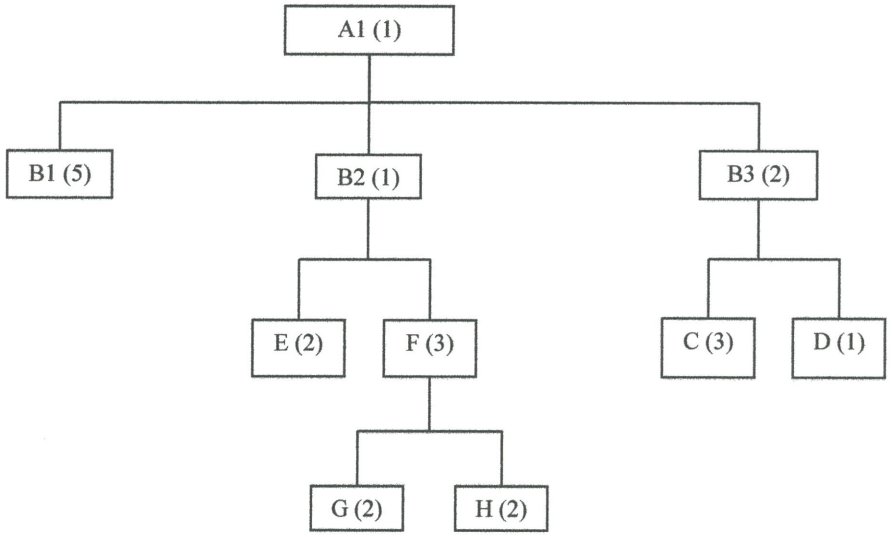

Rajah S5(c) / Figure Q5(c)

Jadual S5(c)(i) / Table Q5(c)(i)

Minggu	4	5	6	7	8	9
Permintaan			88	90		120

Jadual S5(c)(ii) / Table Q5(c)(ii)

Item	Rule	Lead Time (week)	On-hand inventory	Item	Rule	Lead Time (week)	On-hand inventory
B1	FOQ=50	2	50	E	FOQ=50	1	0
B2	POQ (P=2)	1	60	F	L4L	1	0
B3	FOQ=50	1	79	G	FOQ=400 safety stock = 100	1	200
C	FOQ=70	3	14	H	FOQ=100	4	3
D	FOQ=50	2	17	A1	L4L	1	0

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COURSE — *CODE COURSE*

Jadual S5(c)(iii) / Table Q5(c)(iii)

Item: **A1**	Lot Size: Lead Time:							
	Week							
Gross Requirements								
Scheduled Receipts								
Projected-on-hand inventory								
Planned Receipts								
Planned Order Releases								

Item: **B2**	Lot Size: Lead Time:							
	Week							
Gross Requirements								
Scheduled Receipts								
Projected-on-hand inventory								
Planned Receipts								
Planned Order Releases								

Item: **F**	Lot Size: Lead Time:							
	Week							
Gross Requirements								
Scheduled Receipts								
Projected-on-hand inventory								
Planned Receipts								
Planned Order Releases								

Item: **G**	Lot Size: Lead Time: Safety Stock:							
	Week							
Gross Requirements								
Scheduled Receipts								
Projected-on-hand inventory								
Planned Receipts								
Planned Order Releases								

 # Fill in above table and attached together with your answer script.

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Rumus/Formula:

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

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

$$\left.\begin{array}{l} f(x,y) = max(|x - a_i| + |y - b_i|) \\ First\ point\text{:}\ (x_1, y_1) = 0.5(c_1 - c_2\ , c_1 + c_3 + c_5) \\ Second\ point\text{:}\ (x_2, y_2) = 0.5(c_2 - c_4\ , c_2 + c_4 - c_5) \end{array}\right\} Minimax\ formula$$

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

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

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

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