UNIVERSITI TUN HUSSEIN ONN MALAYSIA

PEPERIKSAAN AKHIR
SEMESTER II
SESI 2008/2009

NAMA MATA PELAJARAN	:	KEJURUTERAAN INDUSTRI
KOD MATA PELAJARAN	:	BDA 4012
KURSUS	:	4 BDD
TARIKH PEPERIKSAAN	:	APRIL/MEI 2009
JANGKA MASA	:	2 JAM 30 MINIT
ARAHAN	:	JAWAB EMPAT (4) SOALAN SAHAJA DARIPADA LIMA (5) SOALAN.

KERTAS SOALAN INI MENGANDUNGI TUJUH (7) MUKA SURAT

Q1 (a) Briefly explain the followings:

(i) What is fixed-position layout? (2 marks)

(ii) Why fixed-position layout is preferred in certain industries? (2 marks)

(b) Table 1 shows the coordinates of major machineries in a company and their frequency of breakdown. The factory manager has decided to have a centralised maintenance department responsible for the routine maintenance activity. Using minisum model, recommend the suitable location to place the maintenance department.

(10 marks)

Table 1: Machinery Coordinates and Frequency of Breakdown

Machine	X, Y Coordinates	Frequency of Breakdown
A	(1, 2)	8
B	(8,10)	9
C	(6, 8)	7
D	(2, 9)	18
E	(3, 5)	2
F	(9, 1)	12

(c) The average demand for one specific product in the year of 2008 is 1,500 units per month. The demand in 2009 is forecasted to have an increase of 25% from previous year. The product is sold at $200 per unit and the holding cost is 15% of the sale price. Cost involved for setting the machines to produce a batch of the product is $1,200. The factory is in operations for 20 days per month and the production rate is 150 units per day.

(i) Propose the optimum order quantity for the product that will result to minimum inventory cost. (6 marks)

(ii) Calculate the expected total inventory cost. (5 marks)

Q2 (a) Briefly explain the principles of motion economy regarding the usage of hands and arms in manual work.

(4 marks)

(b) The cost to relocate machineries to new construction sites is summarised in Table 2. Determine the optimum relocating cost using assignment technique.

(10 marks)

Table 2: Relocation Cost

	Site A	Site B	Site C
Machine 1	$1,100	$1,500	$1,900
Machine 2	$1,200	$1,400	$1,800
Machine 3	$1,000	$1,700	$2,000
Machine 4	$1,300	$1,600	$2,100

(c) The flow diagram of an assembly process is shown in Figure Q2. The relevant data on scrap rate and processing time at each work centre is summarised in Table 3. The company uses the operation policy of 8 hours per day, 24 days per month and 12 months per year.

(i) If the average monthly demand for product A is 2,000 units per month, compute the quantity of input required per year at work centre C2.

(3 marks)

(ii) How many work centre A must be set up in order to meet the customer demand of 2,000 units per month?

(4 marks)

(iii) In specific weeks, the input available at work centre D3 is 2,100 units per day. Compute the expected daily output at work centre C3 during these specific weeks.

(4 marks)

Table 3 : Workcentres Scrap Rate and Processing Time

Work centre	Scrap Rate	Processing Time (min/unit)	Work centre	Scrap Rate	Processing Time (min/unit)
A	1.5%	13	C3	3.1%	5
B	2.0%	25	D1	4.0%	21
C1	2.3%	32	D2	5.5%	17
C2	1.7%	9	D3	6.2%	8

Q3 (a) Briefly explain what ergonomics is and how can it help to improve the working environment in manufacturing industries?

(4 marks)

(b) A work sampling study conducted at a metal coating plant has resulted to the data in Table 4. 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.

(3 marks)

(ii) If the total demand for the plant is 14,500 units per month, determine the overtime period per day that must be arranged to meet the customers demand. Only 70% employees are willing to work overtime and the overtime is arranged on every working day.

(7 marks)

Table 4: 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%

(c) SriBengkal Sports Company produces special athlete bags in its plant in Malacca. The final assembly of the bags requires eight operations given in Table 5. The plant operates 8 hours per day with production target of 30 bags per day.

(i) Draw precedence diagram for the assembly process. (3 marks)

(ii) Compute the cycle time. (2 marks)

(iii) Determine the theoretical minimum number of workstations. (1 mark)

(iv) Using longest operating time rule, assign tasks to the workstations in order to have appropriate line balancing. (5 marks)

Table 5: Process Time and Immediate Predecessors for Assembly Process

Task	Time Required (min)	Immediate Predecessors
1	12	-
2	14	-
3	6	-
4	4	3
5	6	1,2,4
6	3	5
7	3	1
8	12	6,7

Q4 (a) Describe the purposes of Pareto diagram. (4 marks)

(b) Figure Q4 shows the product structure and quantities of each component needed to assemble a portable grinder called Alpha. Using data in Table 6 and Table 7, prepare MRP table for finished product Alpha, component B and component D. (12 marks)

Table 6: Data for Lead Time, Quantity on Hand and Ordering Rules

Item	Lead Time (week)	Quantity On Hand (unit)	Rules
Alpha	1	10	Lot for Lot
B	2	20	FOQ (50)
C	3	0	
D	1	100	POQ (P=3), safety stock 50
E	1	10	
F	1	50	

Table 7: Customers Demand for Alpha

Period (week)	4	5	6	7	8	9	10	11
Customers Demand (units)				50		50		100

(c) The number of transistors (in millions) made at a plant in Japan during the last five years is shown in Table 8.

(i) Forecast the number of transistors to be made at year 6 using weighted moving average method. The weight factors are: 0.6 for last year, 0.3 for two years ago and 0.1 for three years ago.

(2 marks)

(ii) Using exponential smoothing method, forecast the number of transistors to be made at year 6 and 7. The forecast value for year 3 is 198 million units whereas the production quantity for year 6 equals 95% of the forecast value. Assume $\alpha = 0.25$.

(7 marks)

Table 8: Annual Production Quantity (million units)

Year	Transistors
1	140
2	160
3	190
4	200
5	210

Q5 (a) Briefly describe the objectives of six sigma. (4 marks)

(b) Briefly describe the definition of kaizen. (4 marks)

(c) Small boxes of NutraFlakes cereal are labelled "net weight 100 grams." Each hour, random samples of size n = 4 boxes are weighted to check process control. Five hours of observations yielded the following data in Table 9.

(i) Determine upper and lower control limits for $\overline{X}$-chart and R-chart. Use the factors in Table 10 to compute the control chart limits.

(12 marks)

(ii) Is the process in control? Explain your answer. (2 marks)

(iii) Two weeks later, a set of data was taken with these readings: 107, 100, 105, 94. Is the current process in control? Explain your answer. (3 marks)

Table 9: Process Control Data

	Weight (grams)			
Time	Box 1	Box 2	Box 3	Box 4
9 am	98	104	99	103
10 am	101	102	99	98
11 am	99	105	103	101
12 noon	97	98	103	102
1 pm	97	101	99	99

Table 10 : Factors for Calculating $\overline{X}$ and R Control Charts

Size of sample (n)	Factor for UCL and LCL for $\overline{X}$ -charts (A_2)	Factor for LCL for R-charts (D_3)	Factor for UCL for R-charts (D_4)
2	1.880	0	3.267
3	1.023	0	2.575
4	0.729	0	2.282
5	0.577	0	2.115
6	0.483	0	2.004
7	0.419	0.076	1.924
8	0.373	0.136	1.864
9	0.337	0.184	1.816
10	0.308	0.223	1.777

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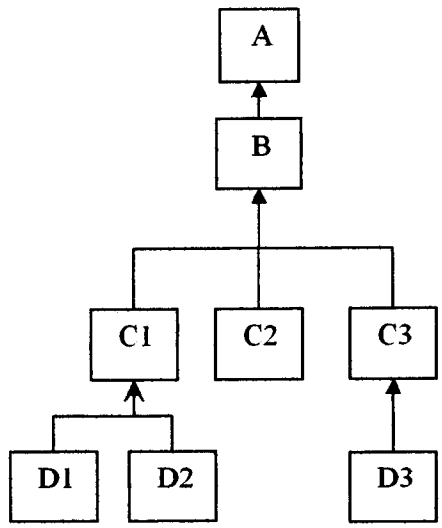

FIGURE Q2

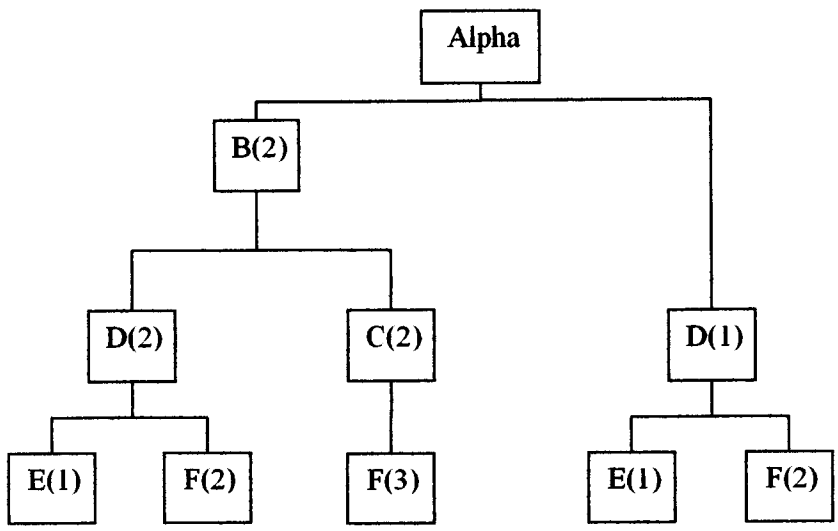

FIGURE Q4