UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2011/2012

COURSE NAME	:	INDUSTRIAL ENGINEERING
COURSE CODE	:	BPB 31303
PROGRAMME	:	3 BPB
EXAMINATION DATE	:	JUNE 2012
DURATION	:	3 HOURS
INSTRUCTION	:	ANSWER **FOUR (4)** OUT OF FIVE QUESTION

THIS QUESTION PAPER CONSISTS OF **SIX (6)** PAGES

Q1 (a) The administration at UTHM wants to construct a new student athletic, shopping, and dining complex on campus. The university planning office is considering possible sites around the campus. They have studied a number of factors related to the location of the complex and they have scored the most important ones for each site as follows in **Table Q1(a)**.

Table Q1(a): Complex location and score

		Score (0 to 100)			
Location	Weight	Site 1	Site 2	Site 3	Site 4
1. Auto traffic flow	0.25	70	75	84	68
2. Student/dorm concentration	0.20	65	91	85	96
3. Parking availability	0.15	100	83	90	92
4. Utilities	0.15	87	96	80	85
5. Proximity to local merchants	0.10	69	85	80	95
6. Drainage	0.10	50	68	92	77
7. Aesthetic considerations	0.05	86	100	95	80

Calculate the best site using the factor rating method.

(5 marks)

(b) Suara Communications Company owns and operates cable television systems in five districts in the Johor state. They want to construct a centralized service facility from which to send out their service trucks for repair and installations. The districts have the following sets of location coordinates and annual number of repair truck visits. Refer **Table Q1(b)**.

Table Q1(b): Sets of location coordinates

A	B	C	D	E
$x_A = 20$	$x_B = 55$	$x_C = 25$	$x_D = 10$	$x_E = 60$
$y_A = 20$	$x_B = 30$	$x_C = 60$	$x_D = 40$	$x_E = 50$
$w_A = 420$	$w_B = 610$	$w_C = 505$	$w_D = 370$	$w_E = 570$

Calculate the possible locations for the central service facility using the center-of-gravity method.

(8 marks)

(c) Adabi's Food Market owns grocery stores in four districts in a three state area. They want to construct a centrally-located warehouse to process, package, and distribute produce and other food items for their four stores. The items are transported in 40-foot trailer trucks. The stores have the following set of coordinates and annual shipments in **Table Q1(c)**.

Table Q1(c): Set of coordinates and annual shipments

A	B	C	D
$x_A = 60$	$x_B = 110$	$x_C = 35$	$x_D = 70$
$y_A = 130$	$x_B = 40$	$x_C = 90$	$x_D = 50$
$w_A = 145$	$w_B = 210$	$w_C = 160$	$w_D = 95$

Three sites are being considered for the warehouse with the following coordinates:

Site 1: $x_1 = 50$, $y_1 = 60$
Site 2: $x_2 = 100$, $y_2 = 70$
Site 3: $x_3 = 40$, $y_3 = 90$

Calculate the best location for the warehouse using the load-distance technique.

(12 marks)

Q2 The ATB Basic Block Sdn Bhd needs to produce 4000 boxes of blocks per 40-hour week to meet upcoming holiday demand. The process of making blocks can be broken down into six work elements. The precedence and time requirements for each element are as **Table Q2** below.

Table Q2: The precedence and time requirements for each element

Work Element	Precedence	Performance Time (Min)
A	-	0.10
B	A	0.40
C	A	0.50
D	-	0.20
E	C,D	0.60
F	B,E	0.40

(a) Draw and label a precedence diagram for the production process.

(10 marks)

(b) Develop a balanced assembly line and calculate the efficiency of the line.

(15 marks)

3

Q3   To fix up the standard time of a particular work 10 operators were kept under observation for 5 days by a work sampling study group. The performance rating and number of times the workers were found working each day were noted and given in **Table Q3**.

Table Q3: Number of workers time

Operator No.	Performance rating	X1	X2	X3	X4	X5
1	100	10	12	8	10	8
2	110	15	16	14	11	15
3	120	20	22	18	21	19
4	125	22	23	22	28	25
5	130	30	28	32	30	31
6	135	28	27	25	29	28
7	140	21	25	20	27	20
8	145	20	18	20	15	19
9	150	15	14	16	15	15
10	155	9	11	8	6	10

The total number of observations each day were 200. The number of times the workers were found idle or abstaining from their respective work places are;

$X1 = 10$
$X2 = 5$
$X3 = 17$
$X4 = 16$
$X5 = 10$
The total production during 5 days = 5000
The working hours in a day = 8

Calculate the standard time for the job, assuming 20% as allowance.

(25 marks)

4

Q4 (a) A work operation consisting of three elements has been subjected to a stopwatch time study. The recorded observations are shown in the Table Q4(a) . By union contract, the allowance time for the operation is personal time 5% , delay 5% and fatique 10%.

Table Q4a: The recorded observations

Job Element	Observations (minutes)						Performance Rating (%)
	1	2	3	4	5	6	
A	0.1	0.3	0.2	0.9	0.2	0.1	90
B	0.8	0.6	0.8	0.5	3.2	0.7	110
C	0.5	0.5	0.4	0.5	0.6	0.5	80

Determine the standard time for the work operation.

(9 marks)

(b) The preliminary work sample of an operation indicates the following:

Number of times operator working   60
Number of times operator idle   40
Total number of preliminary observations   100

Compute the required sample size for a 99.73% confidence level with 4% precision.

(8 marks)

(c) ATB Company has just observed a job in its laboratory in anticipation of releasing the job to the factory for production. The firm wants rather good accuracy for costing and labor forecasting. Specifically, it wants to provide a 99% confidence level and a cycle time that is within 3% of the true value.

Table Q4(c) : Data collected from observations

Observation	Time
1	1.7
2	1.6
3	1.4
4	1.4
5	1.4

Calculate a number of observations should it make.

(8 marks)

Q5 (a) Conveyors are common equipment found in industry. They are used to move products and supplies in and out of a work site, from one part of the plant to another, and between workstations. In all kinds of assembly operations, ranging from microelectronics to the automotive industry, conveyors, whether powered or unpowered, roller or belt, overhead or floor, is literally the backbone of the production system.

Discuss how we make work at a conveyor safer.

(7 marks)

(b) Office work is visually demanding and requires good lighting for maximum comfort and productivity. "Good" lighting means providing enough illumination so that people can see printed, handwritten or displayed documents clearly but are not blinded by excessively high light levels (a cause of glare).

(i) Explain about signs of poor lighting.

(3 marks)

(ii) Explain do computers create a challenge for lighting designers.

(3 marks)

(c) Continuous standing or sitting while working is a common source of discomfort and fatigue. Frequent changes of body positions, including alternating between sitting and standing, helps to avoid fatigue.

(i) Explain with an example of a workstation for sitting.

(4 marks)

(ii) Explain with an example of a workstation for standing.

(4 marks)

(iii) Describe with an example of a semi-circular workstation.

(4 marks)

END OF QUESTION PAPER