Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2017/2018

COURSE NAME	:	INDUSTRIAL ENGINEERING
COURSE CODE	:	BPB 31303
PROGRAMME CODE	:	BPB
EXAMINATION DATE	:	JUNE / JULY 2018
DURATION	:	2 HOURS AND 30 MINUTES
INSTRUCTION	:	ANSWER **ALL** QUESTIONS

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

Q1 (a) List **FIVE (5)** tools or techniques used to improve productivity of the organization by optimum utilisation of resources.

(5 marks)

(b) Explain the importance of an Industrial Engineer in achieving Industry Revolution 4.0.

(5 marks)

Q2 An assembly line operates 60 hours per week with a desired output of 3600 units per week. **Table Q2** contains the information on this product's task times and precedence relationships.

Table Q2: The precedence and time requirements for each element

Task	Task Time (Seconds)	Immediate Predecessor
A	15	Nil
B	23	A
C	17	B
D	42	B
E	15	B
F	37	C
G	5	D, E
H	12	F, G
I	34	H
J	27	H
K	18	I, J
L	7	K

(a) Sketch the precedence diagram.

(3 marks)

(b) Calculate the cycle time for this operation (in second).

(3 marks)

(c) Calculate the theoretical minimum number of workstations.

(3 marks)

(d) Propose the balance line using the longest task time rule to break ties if exist.

(13 marks)

(e) Determine the overall efficiency of the line balance.

(3 marks)

Q3 (a) List **FIVE (5)** factors affecting plant layout.

(5 marks)

(b) Describe **FOUR (4)** types of assembly layouts with appropriate examples.

(10 marks)

(c) Discuss the Product Process Matrix with appropriate ilustration.

(10 marks)

Q4 Ergonomics is the scientific discipline concerned with the understanding of interactions among humans and other elements of a system. This decipline applies theory, principles, data and methods to design in order to optimise human well-being and overall system performance.

(a) Describe ergonomics in term of:

(i) Engineering psychology

(4 marks)

(ii) Macro-ergonomics

(4 marks)

(iii) Seating ergonomics

(4 marks)

(b) **Figure Q4** shows five (A, B, C, D and E) important measurement that must be considered while sitting in front a computer workstation.

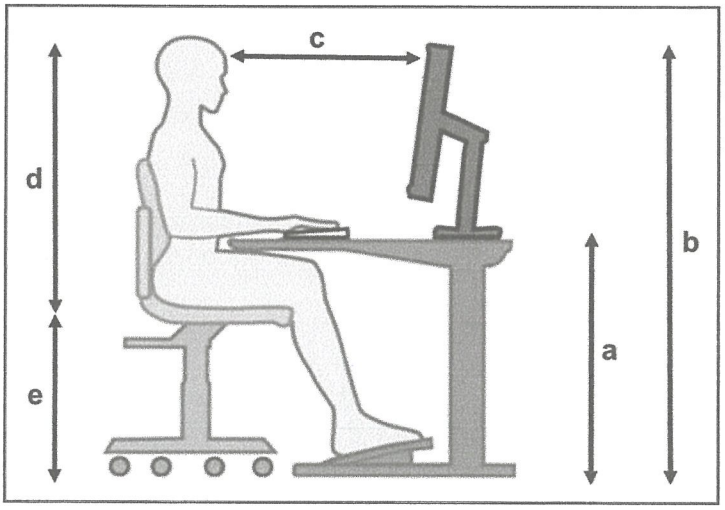

Figure Q4: Ergonomic important measurements

Explain A, B, C, D and E and the importance of each measurement dimensions.
(10 marks)

(c) Regardless of their experience intelligence, motivation or vigilance, human beings make "silly" mistakes.

State **THREE (3)** situations associated with an increased risk of error.
(3 marks)

Q5 Visual discomfort and musculoskeletal discomfort, particularly in the neck and shoulders, are occupational health concerns for people who work with computers. A total of twelve anthropometric dimensions were measured. All the twelve dimensions measured are: (1) stature, (2) shoulder breadth, (3) chest depth, (4) sitting height, (5) sitting eye height, (6) sitting shoulder height, (7) popliteal height, (8) sitting knee height, (9) forearm hand length, (10) sitting elbow height, (11) thigh clearance, and (12) head length as shown in **Figure Q5(a)**.

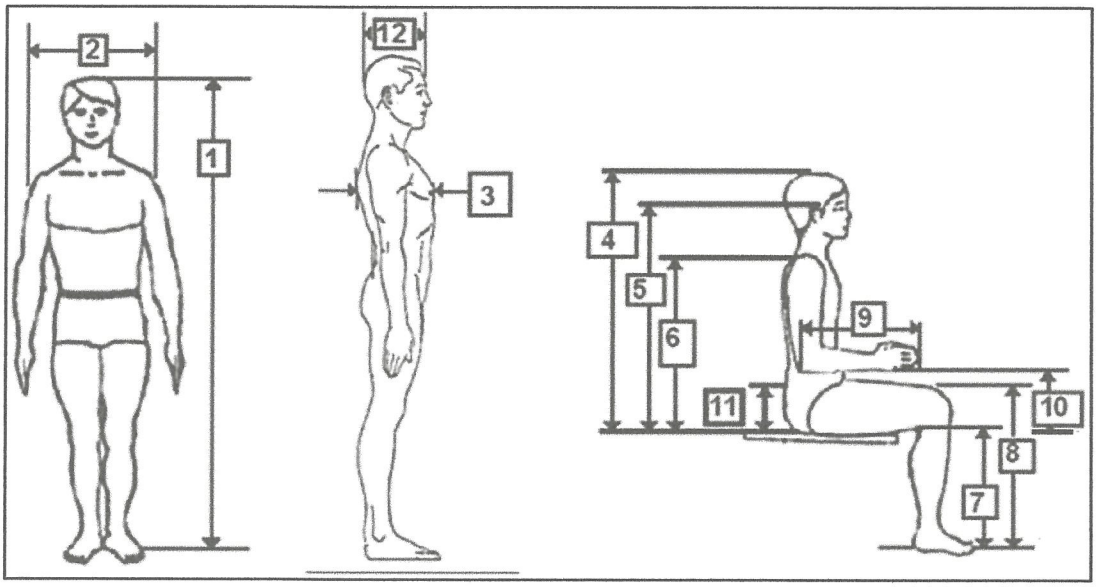

Figure Q5(a): Twelve measured anthropometric data.

The anthropometric data of 273 males Malaysian citiezen and 365 Malaysian citizen females are presented in **Table Q5**.

Table Q5 : Anthropometric data for male and female Malaysian citizen, all units are in mm.

No	Demension	Male		Female	
		Average	Standard Deviation	Average	Standard Deviation
1	Stature	1699.51	61.39	1566.74	64.09
2	Shoulder breadth	484.70	57.68	440.72	57.53
3	Chest depth	217.40	47.89	214.39	43.02
4	Sitting height	857.95	59.44	792.58	80.64
5	Sitting eye height	738.40	69.50	677.28	81.16
6	Sitting shoulder height	561.85	61.27	515.56	69.64
7	Popliteal height	455.85	39.74	430.86	44.86
8	Sitting knee height	512.09	69.12	468.66	67.06
9	Forearm hand length	468.14	40.96	422.36	35.40
10	Sitting elbow height	219.78	47.09	225.00	55.76
11	Thigh clearance	188.11	44.16	196.25	54.32
12	Head length	207.70	27.87	198.44	33.98

Assume that the anthropometric data are normally distributed. As an Industrial Engineer, you are required to propose the design of an adjustable chair, as shown in **Figure Q5 (b)** with work surfaces dimension for Malaysian citizens.

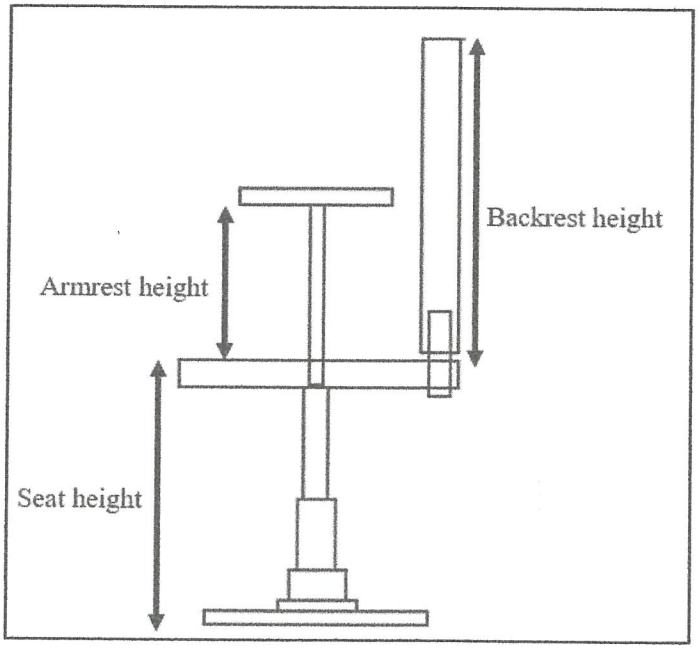

Figure Q5 (b): Adjustable chair

(a) Compute the 5th and 95th percetile of anthropometric data for male and female Malaysian citizen.

(5 marks)

(b) Propose your design with work surfaces dimension based on **Table Q5**, **Figure Q5(b)**, and answers from **Q5(a)**.

(10 marks)

- END OF QUESTIONS -