Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2013/2014

COURSE NAME	:	INDUSTRIAL ENGINEERING
COURSE CODE	:	BPB 31303
PROGRAMME	:	2BPB/3BPB
EXAMINATION DATE	:	JUNE 2014
DURATION	:	2 HOURS 30 MINUTES
INSTRUCTION	:	ANSWER **ALL** QUESTIONS

THIS QUESTION PAPER CONSISTS OF **FIVE (5)** PAGES

Q1 The desired daily output for an assembly line is 360 units. This assembly line will operate 450 minutes per day. Table **Q1** contains information on this product's task time and precedence relationships.

Table Q1

TASK	TASK TIME(SECONDS)	IMMEDIATE PREDECESSOR
A	30	-
B	35	A
C	30	A
D	35	B
E	15	C
F	65	C
G	40	E,F
H	25	D,G

(a) Sketch the precedence diagram.

(2 marks)

(b) Calculate the cycle time for this operation.

(3 marks)

(c) Calculate the theoretical minimum number workstations.

(3 marks)

(d) Propose a balanced line in an order of the largest number of following tasks using the longest task time as a secondary criterion to break ties if exist.

(15 marks)

(f) Determine the overall efficiency of the balanced assembly line.

(2 marks)

Q2 An Autopart component manufacturer produces a component that consists of four parts W, X, Y and Z that are purchased from suppliers at a cost of RM0.40, RM0.35, RM0.25 and RM0.15 per piece, respectively. Part W and X are assembled together in assembly line A which can produce 150 components per hour. Part Y undergoes drilling operation at drilling line where each drilling rate is at 60 parts per hour. The drilling line have six drilling machines however only three are operational In the final assembly line, Part Z is assembled together with the drilled part Y and the joined XY part at a rate of 170 components per hour. At present the components are produced in a shift of eight hours per shift and five days a week.

The cost of assembly labour is RM0.30 per part for each assembly line. The cost of drilling is at RM0.17 per part. For drilling, the electricity cost RM0.02 per part. The total overhead cost has been calculated as at RM1,500 per week. The depreciation cost for each drilling machine is calculated at RM10 per week per machine. Other equipment depreciation cost is at RM50 per week.

(a) Sketch a process flow diagram for the above operation.

(5 marks)

(b) Calculate the process maximum capacity (number of components produced per week) for the entire assembly process.

(5 marks)

(c) Suppose a second shift of eight hours is run on assembly line A and the same is done for the final assembly line. Now four instead of three drilling machines are operating in an eight hour shift per day.

Calculate the new process maximum capacity (number of components produced per week) for the entire assembly process.

(5 marks)

(d) The management decides to run a second shift of eight hours for assembly line A and a second shift of only four hours for the final assembly line. In this case, five drilling machines are operating in an eight hour shift per day.

Calculate the new process maximum capacity (number of components produced per week) for the entire assembly process.

(5 marks)

(e) Determine the cost per unit for question **Q2(c)** and **Q2(d).**

(5 marks)

Q3 Figure **Q3** shows a pair of winch on a scaffolding platform. The mountings on a 20 tones winch failed, and the winch was dragged 3 meters through pipe work and scaffolding, narrowly missing personnel in the area. The temporary winch base and deck-mountings had been designed and constructed by an engineering company. A senior engineer made a mistake in specifying the bolts used to fix the winch to the deck. In his calculations, he used the "ultimate" strength instead of the working strength of the bolts, and didn't allow for the load test, which uses a weight well above the normal working load of the winch. The calculations were checked by a less experienced engineer. He found one design error and sent the work-pack back to the senior engineer, without checking further. When the corrected work-pack was sent through to be re-checked the first mistake was checked, but other errors remained. After installation the winch was load-tested by filling a large water bag slung beneath the offshore platform. An inspector was moving round the winch, looking for any problems with the mountings. At times during the test, the inspector placed himself in the path that the failed winch took. Fortunately, he was out of the way when the winch fixings failed catastrophically at 22 tones. The competence of those involved was checked after the incident. All the evidence showed that those involved were competent to carry out the tasks requested of them.

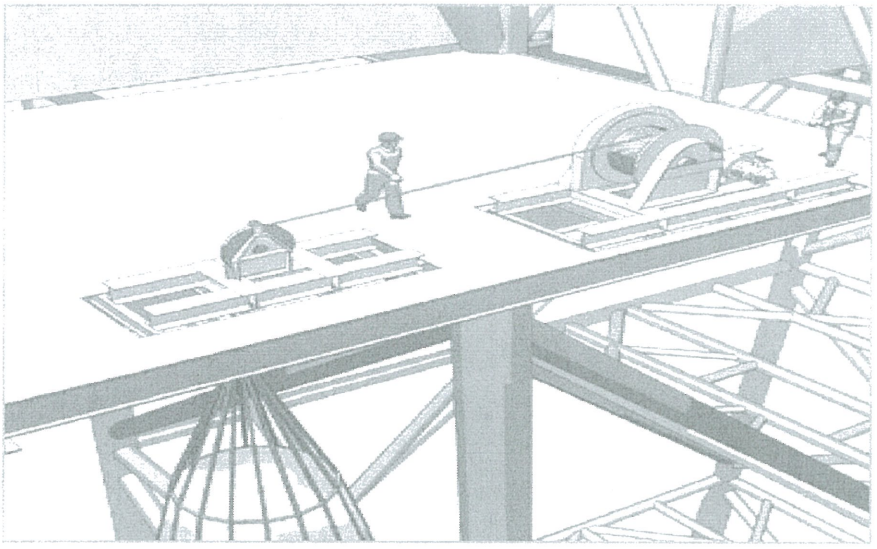

Figure Q3

(a) Analyze the action that had been done by the people involved.

(i) intentionally

(7 marks)

(ii) unintentionally

(8 marks)

(c) Conclude the lesson learned from this incident.

(10 marks)

Q4 (a) Explain the following terms:

(i) Anthropometrics

(5 marks)

(ii) Ergonomics

(5 marks)

(b) **Figure Q4** shows five (A, B, C, D and E) important measurements that must be considered when setting up a computer workstation.

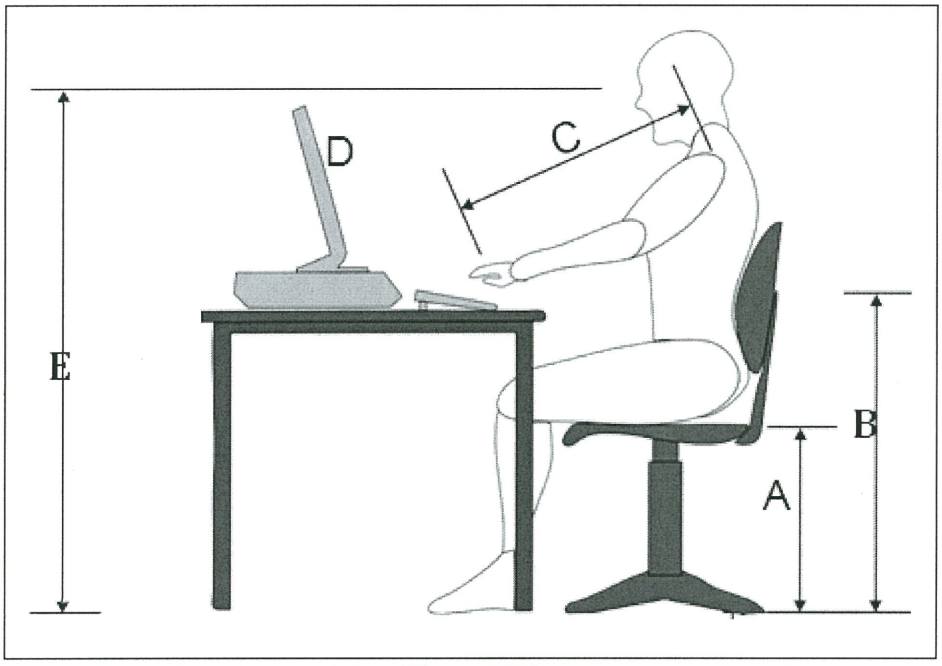

Figure Q4

Explain the importance of the labeled dimension as shown in **figure Q4** important.

(15 marks)

-END OF QUESTION-