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UNIVERSITI TUN HUSSEIN ONN MALAYSIA

**FINAL EXAMINATION
SEMESTER II
SESSION 2012/2013**

COURSE NAME : INDUSTRIAL ENGINEERING
COURSE CODE : BPB 31303
PROGRAMME : 3BPB
EXAMINATION DATE : JUNE 2013
DURATION : 2 HOURS 30 MINUTES
INSTRUCTION : ANSWER ALL QUESTIONS

THIS QUESTION PAPER CONSISTS OF FIVE (5) PAGES

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- Q1** ABC Cendol Enterprise is a one man cendol retail operation. Below is a time study observation sheet for a cendol retail operations. Assuming that the performance rating for all the element is 110% and allowance given is 15%.

Table Q1: Time Study Observation Sheet

Element Description and Breakpoint		cycle				
		1	2	3	4	5
1	Listen to order/taking order	7''	59''	1'56''	2'48''	3'43''
2	Take a bowl and start to shave ice	23''	1'18''	2'10''	3'05''	3'59''
3	Add cendol, coconut milk and syrup into the bowl	47''	1'43''	2'34''	3'29''	4'20''
4	Deliver the bowl to customer and accept payment	53''	1'50''	2'40''	3'38''	4'28''

- (a) Calculate the normal time for each element. (8 marks)
- (b) Calculate the standard time for each element and overall standard time. (10 marks)
- (c) You are required to service non-stop, a long line of customer during lunch break between 12.00 noon to 2.00 pm.

Calculate the number of bowl of cendol you can prepare during that period.

(7 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**.

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)

- Q3** (a) You have been asked to conduct an ergonomic analysis of the crane operators job following increased reporting of pain and discomfort by employees over the last 12 months. The worksite is an industrial site that manufactures steel products. The crane driver is required to operate the crane in order to move heavy material within the building from one process area to another. To view the load, the operator adopts postures shown in the **Figure Q3** below, the seat can be slid forwards and backwards only a small distance. He alternates between sitting and standing while performing this task over an eight hour shift. He is allowed two rest breaks per shift, a 20 minutes tea break, and a 45 minutes lunch break. The work is a continuous nature. Using the photograph of the crane driver/operator and the information above, answer the following questions:



Figure Q3: Crane Operator

- (i) List **THREE (3)** physical ergonomic risks which may be present in **Figure Q3**.
(3 marks)
 - (ii) Explain why these postures increase the physical ergonomic risks to the crane operator, referring to the upper limb postures of the crane operator in **Figure Q3**.
(3 marks)
 - (iii) List **THREE (3)** work organization risk factors that might also contribute to the risk associated with the task in **Figure Q3**.
(3 marks)
 - (iv) Explain if there are any other ergonomic risk factors that you might need to consider in this industrial environment that may also contribute to increasing the risk associated with the task in **Figure Q3**.
(3 marks)
 - (v) Explain **THREE (3)** reasonable and practicable changes that you might recommend to management in order to reduce risk, based on your identification and assessment of the ergonomic risks on task in **Figure Q3**.
(3 marks)
- (b)
- (i) Explain musculoskeletal disorders.
(2 marks)
 - (ii) Explain how do you know if musculoskeletal disorders are really work related.
(3 marks)

(iii) Explain how ergonomics can be applied in workplace in order to avoid musculoskeletal disorder.

(3 marks)

(iv) Explain the importance of ergonomics to a company and its employees.

(2 marks)

Q4 Ah Keong Nut Ice is a famous ice kacang shop in Penang. In order to improve its operation, the shop's manager is analyzing the process at their shop. The general flow of the process is shown in **Figure Q4**. Please note that there is a separate person working at each of the steps in the process and the shop operates 10-hours work day.

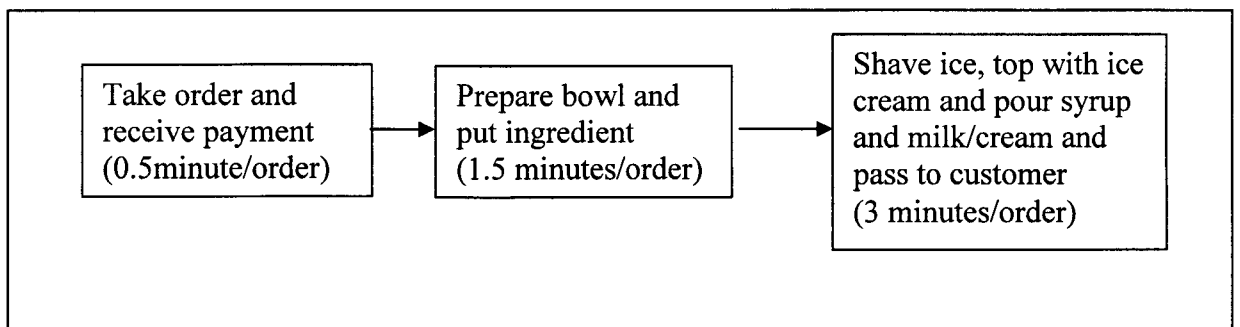


Figure Q4 : Ice-Kacang Making Process Flow

(a) Calculate the current maximum output

(8 marks)

(b) Ah Keong intend to increase output by adding another worker.

(i) Determine which operation should have new worker.

(1 marks)

(ii) Calculate the new maximum output.

(8 marks)

(c) Another option that Ah Keong has to increase output is by maintaining the 3 workers operation and reducing 1 minute from ice shaving operation.

Calculate the new maximum output.

(8 marks)

-END OF QUESTION-