ORDRE DES INGÉNIEURS DU QUÉBEC

NOVEMBER 2019 SESSION

Open-book examination
Calculators: only authorized models
Duration: 3 hours

14-IN-A2 ANALYSIS AND DESIGN OF WORK

Question 1 **(**10 points)

a) What is work design and why is it important?
b) What is ergonomics and why is it important in work design?

Explain how it can relate to quality of work life.

Question 2 **(**10 points)

You have been hired as an external consultant to **improve processes** at a business. You are unfamiliar with exactly how the work is currently done but are intimately familiar with **charting techniques** and **data analysis tools**. What is a general sequence for use of these tools and why should you use them in the sequence you specify?

Question 3 **(**20 points)

An undergraduate business student studies diligently in the library during dead week in anticipation of an outstanding performance on her final exams. She asks a friend to spy on her at random intervals to determine what percentage of time she is studying. Over the course of three days, her friend records the following observations:

Observation Period	Times Studying	Times Not Studying	Observations
Monday	20	3	23
Tuesday	21	4	25
Wednesday	10	1	11
Total	51	8	59

If the student wants a 95 percent confidence level and a degree of precision of $\pm$ 0.08, **how many more observations are needed?**

Question 4 **(**10 points)

Compare and contrast the method of time study to the method of work sampling. What are the strengths and limitations of each, and for which applications are they best suited?

Question 5 **(**15 points)

The data in the following table represent time-study observations on a new operation with three work elements. Based on these observations, **find the standard time for the process**. Assume an **8%** allowance factor.

		Observations (times in seconds)			
Element	**Performance Rating**	**1**	**2**	**3**	**4**
1	105%	110.2	110.8	112.3	108.7
2	90%	114.7	115.7	114.8	114.2
3	115%	109.2	109.3	109.2	108.9

Question 6 **(**15 points)

A small manufacturer that offers "hand crafted" furniture has developed a new style of desk that they believe will be very successful in the marketplace. It is expected that the first desk will take about 60 hours of craftsmen's time to complete. They expect a 90% learning curve for this desk.

a) How long will it take to make the 20th desk? The firm is considering accepting an order for 25desks.
b) How many hours of labor will this require for all 25?

Question 7 (3 points)

What are the key advantages and disadvantage of:

a) Time-based pay plans?
b) Incentive plans?

Question 8 (10 points)

An initial analysis of a laboratory activity resulted in the first table below. After this analysis, the managers determined that their element descriptions were not as accurate as they should have been, in fact, they had left out an element, underestimated a distance, and understated the need for accuracy. They revised the table of element data, which appears in the second table.

Original Activity: Pouring tube specimen

Element description	Element code	TMU
Get tube from rack	AA2	35
Get stopper, place on counter	AA2	35
Get centrifuge, place at sample tube	AD2	45
Pour (3 sec.)	PT	83
Place tubes in rack	PC2	40

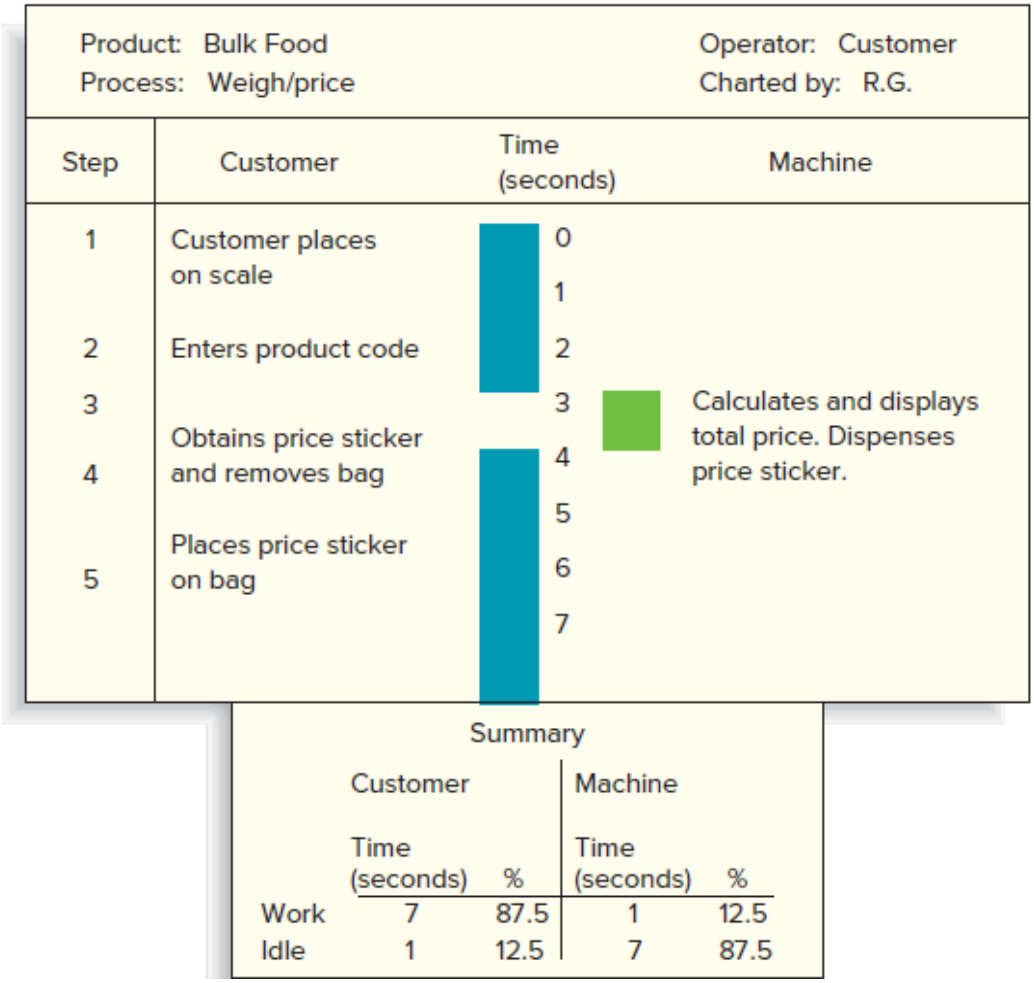
Revised Activity: Pouring tube specimen

Element description	Element code	TMU
Get tube from rack	AC3	70
Get stopper, place on counter	AA2	35
Get centrifuge, place at sample tube	AD2	45
Pour (3 sec.)	PT	83
Get stopper, place on tube	AC1	40
Place tubes in rack	PC2	40

a) Calculate the total standard minutes for the original activity "pouring tube specimen."
b) Calculate the total standard minutes for the revised activity "pouring tube specimen."
c) What is the increase, in seconds, from the first version to the second?
d) Why we can see this difference from both analysis and what conclusion can you get?

Question 9 **(**7 points)

a) What does this figure refer to?
b) Why does the work design analyst use this type of chart?
c) Can you explain the meaning of this chart?



Product: Bulk Food
Process: Weigh/price
Operator: Customer
Charted by: R.G.

Step	Customer	Time (seconds)	Machine
1	Customer places on scale	0–3	
2	Enters product code		
3			Calculates and displays total price. Dispenses price sticker.
4	Obtains price sticker and removes bag	3–7	
5	Places price sticker on bag		

Summary

	Customer		Machine	
	Time (seconds)	%	Time (seconds)	%
Work	7	87.5	1	12.5
Idle	1	12.5	7	87.5