**MBA648: Business Process Analytics**

**Assignments 1**

**(Given: Feb 05, 2024, Due Date: February 16, 2024, at 23.55 hrs on Dropbox)**

**SUBMISSION GUIDELINES**

**General Guidelines:**

* Every group should have a team coordinator, who is responsible for submitting the formatted copy of the files in the dropbox (on course website).
* Every submission should be composed of exactly two files: (1) word file (.doc) or a .pdf file describing the procedures/solutions and (2) an excel file with all the calculations and details.
* Also highlighting the final answers (wherever applicable).
* State your assumptions very clearly.
* Show sample calculations wherever necessary.
* No email submissions are acceptable.

**Formatting Guidelines:**

* Include a cover page that includes the names and student IDs of the members of the group.
* Use 8 1/2" x 11" (22x 28 cm) paper with margins of at least 3/4" (2 cm) all around.
* Use 12-point font in professional fonts such as Times New Roman, Constantia, Arial, etc.
* Text must be single-spaced with a maximum of six lines per inch.
* If you have tables/figures in the .doc file, make sure that the tables/figures is formatted to fit the document (with **legible font size**). Format the size of the tables/figures so that you leave a margin of at least 3/4" (2 cm) all around.

Q 1: Refer to the Kristen’s Cookie Case. Currently, the company operates on a make-to-order as each order is potentially unique. I**f you decide to sell standard cookies instead and decide to operate as a make-to-stock process,** how should you change the production system? The order-taking process? Other policies?

**Describe (with little or no calculations)** the impact of the changes on following performance measures: *cycle time*, *throughput time, total labor time, total throughput, and cost per cookie.*

Q 2: Refer to the Kristen Cookie Case. Currently, the company has one oven, and is the bottleneck stage in the process. However, the company is considering increasing the production capacity of the cookie-making process by **replacing with a new oven that can accommodate two trays at a time.**

Analyse the impact of this investment on following performance measures: *cycle time*, *throughput time, total labor time, total throughput, and cost per cookie* under various scenarios listed below. Draw activity-time diagrams (Gantt chart) to show the flow time and cycle time under each scenario (in excel).

Summarize your results in the table shown below:

|  |  |  |
| --- | --- | --- |
|  | Scenario 1  One-tray oven | Scenario 2  Two-tray oven |
| Flow time of first order (min) |  |  |
| Cycle Time (min) |  |  |
| Bottleneck |  |  |
| Total Labor Time (min/order) |  |  |
| Total Throughput  (# orders of cookies in 4 hr). |  |  |
| Total Throughput (orders)  (roundup). |  |  |
| Total Throughput (dz). |  |  |
| Total Throughput (#cookies). |  |  |
| Total Throughput Time (min) |  |  |
| Total Ingredient Cost ($) |  |  |
| Total Labour Cost ($) |  |  |
| Cost/cookie ($) |  |  |

Q 3: Refer to the Natural Blends Case. Consider the following production settings:

* The production system was running three sizes of oranges: large, medium, and small in **equal amounts every week** (not necessarily equal amounts every day).
* Furthermore, each orange size be processed at least once per day, but as long as equal amounts of all three sizes were processed during a week.
* Again, consider just the process steps of extraction, filtration and concentration as shown in the figure below (**note that there is no storage between the stages**):

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Here are the two scenarios under the setting described above:

* Scenario 1: 8 batches of each size

S M L S | M L S M | L S M L | S M L S | M L S M | L S M L

* Scenario 2: 8 batches of each size

S M M L | L S S M | M L L S | S M M L | L S S M | M L L S |

Construct the activity-time diagram. What is the daily and weekly production capacity during each of these scenarios? What is the total amount of juice concentrate you can process through the three process steps (two through four) in one 8-hour workday and 6 days a week?

Q 4: Refer to the Xooter example in the book (chapter 4). The assembly line manager would like you to design a balanced assembly operation to achieve a demand rate of 96 units/day or 480 units/week. This implies that the desired cycle time **of 300 seconds.** The assembly line operates 8 hours/day for 5 days/week. (Assume that every workstation needs to be equipped with one worker. Assume a labour cost of $12/h).

Based on the required cycle time of 300 second, assign the task to the workstations while maintaining the precedence constraints and minimizing the number of workstations needed. Calculate the utilization of each workstation. Compute the efficiency of the line. Also compute the cost of direct labor and idle labor.

The task times and the precedence relationships of the tasks are given below:

|  |  |  |
| --- | --- | --- |
| **Operations No.** | **Tasks** | **Durations (Seconds/unit)** |
| 1 | Prepare cable | 30 |
| 2 | Move cable | 25 |
| 3 | Assemble washer | 100 |
| 4 | Apply fork, threading cable end | 66 |
| 5 | Assemble socket head screws | 114 |
| 6 | Steer pin nut | 49 |
| 7 | Brake shoe, spring, pivot bolt | 66 |
| 8 | Insert front wheel | 100 |
| 9 | Insert axle bolt | 30 |
| 10 | Tighten axle bolt | 43 |
| 11 | Tighten brake pivot bolt | 51 |
| 12 | Assemble handle cap | 118 |
| 13 | Assemble brake lever and cable | 110 |
| 14 | Trim and cap cable | 59 |
| 15 | Place first rib | 33 |
| 16 | Insert axles and cleats | 96 |
| 17 | Insert rear wheel | 135 |
| 18 | Place second rib and deck | 84 |
| 19 | Apply grip tape | 56 |
| 20 | Insert deck fasteners | 75 |
| 21 | Inspect and wipe off | 95 |
| 22 | Apply decal and sticker | 20 |
| 23 | Insert in bag | 43 |
| 24 | Assemble carton | 114 |
| 25 | Insert Xootr and manual | 94 |
| 26 | Seal carton | 84 |
|  | **TOTAL** | **1890** |