

# University of Ruhuna - Faculty of Technology

Bachelor of Engineering Technology

Level 4 (Semester 1) Examination, December 2020

TCS 4132 – Operations Management for Technologists

## Instructions to candidates (Please Read Carefully):

All questions should be answered.

Submit all workings and calculations.

Calculators are allowed

Time allowed: 02 hours

**Total Marks: 100**

## Question 01

- 1) Bandara's yogurt manufacturing business is planning to buy a new machine to expand its current operations. Bandara is considering three (03) options to select the machine with the least cost. Information regarding each machine is given below.

Machine	Fixed cost (Rs.)	Cost per unit (Rs.)	
		Labour cost	Material cost
A	120,000	60	40
B	500,000	35	35
C	2,500,000	10	30

- a) If the business expects to produce 5,000 units per year, which machine should be selected based on the annual cost? (3 marks)
- b) If the business expects to produce 75,000 units per year, which machine should be selected based on the annual cost? (3 marks)
- c) Based on annual cost, at what annual product volume would Bandara be indifferent to select the machine A or machine B? (3 marks)
- d) For what range of annual product volume would each machine be preferred? (6 marks)

2) Quality management ensures that an organization, product or service is consistent. It is focused not only on product and service quality, but also on the means to achieve it.

a) Explain the difference between quality control and quality management. (4 marks)

b) State three (03) categories of quality costs. (3 marks)

3) Just in time (JIT) inventory is an inventory management system with the objectives of having inventory readily available to meet demand, but not to a point of excess where you must stockpile extra products.

a) Mention three (03) disadvantages of maintaining a Just in Time (JIT) inventory approach. (3 marks)

(25 marks)

**Question 02**

1) Aggregate planning develops a medium-term production plan which decides how to meet the medium-term capacity requirements.

a) Mention three (03) capacity options that an organization can use to alter capacity. (3 marks)

b) Explain the importance of aggregate planning for an organization. (3 marks)

2) There are four jobs (A, B, C and D) to be processed by two work stations X and Y. All jobs follow the same sequence of operations; A first and then B. The processing times are given below.

Job	Work station X	Work station Y
A	08	02
B	06	10
C	03	07
D	12	04

a) Determine the processing order for the jobs in order to minimize the total time required for processing all the jobs, one after another. (5 marks)

Ex: 

A	B	C	D
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b) State the rule you used to solve question (a)? (1 marks)

- 3) In a workshop there are four people available to work on four jobs. The following table shows the cost of assigning each person to each job. The objective is to keep the minimum assignment cost.

Person \ Jobs	1	2	3	4
A	20	25	22	28
B	15	18	23	17
C	19	17	21	24
D	25	23	24	24

- a) Develop an optimal assignment in order to minimize the total cost. (13 marks)  
(25 marks)

### Question 03

- 1) Dhananjaya Manufactures is planning to build a warehouse in a new location to support its existing factories. The (X,Y) coordinates for the existing location of the three factories and annual production percentage of each factory are given below.

Factory	Coordinates (Miles)		Annual Production
	X	Y	
A	600	730	20%
B	860	300	30%
C	200	300	50%

- a) If the total annual production volume is 600,000 units, determine the least cost location for the new warehouse using center of gravity method. (5 marks)
- b) Briefly explain three (03) other factors that Dhananjaya Manufactures should consider when selecting the new location. (5 marks)

2) PQR manufacturers introduced a new soap named "Saarathi" to the market. The table below shows the actual demand for Saarathi soap in a shop for the last 8 months.

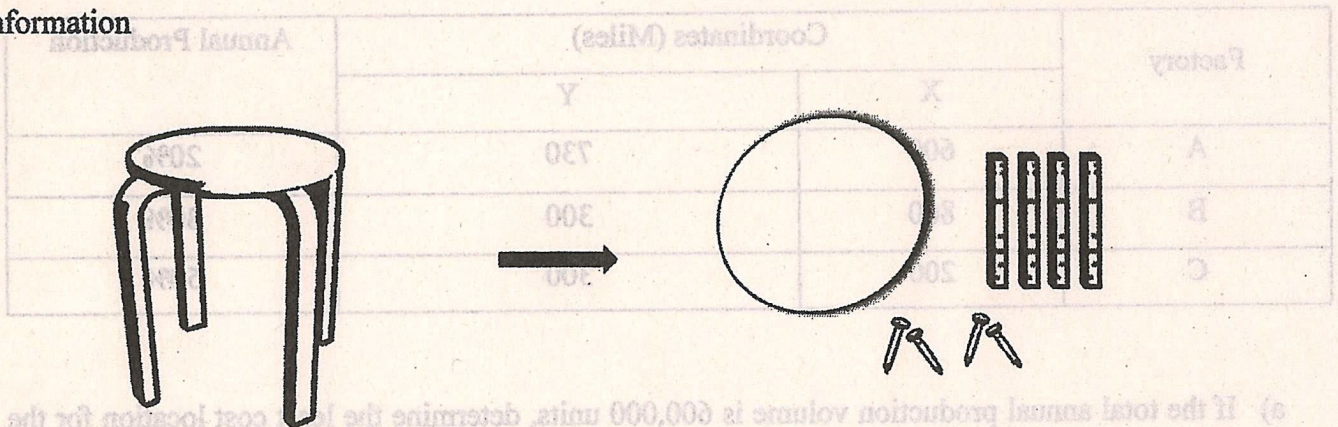
Month	1	2	3	4	5	6	7	8
Demand (units)	23	29	33	40	41	43	49	42

- Calculate a three-month moving average for above mentioned data (5 marks)
- What would be your forecast for the demand in month 9? (2 marks)
- If forecasted demand of month 1 is 20 units, apply exponential smoothing with a smoothing constant of 0.2 to derive a forecast for the demand in month 9. (8 marks)

(25 marks)

#### Question 04

- Sriyantha Company assembles small wooden stools by purchasing stool tops, stool legs and nails from other suppliers. Following information are provided regarding product structures and inventory information



	Stools	Stool tops	Stool legs	Nails
Inventory in hand	3	10	12	-
Lead time (weeks)	1	3	2	2
Scheduled receipts	-	48 by 2 <sup>nd</sup> week	-	-
Lot size	Same as the net requirement (Lot-for-lot)			

If the total requirement for stools includes 100 units of stools in 5<sup>th</sup> week and 80 units of stools in 7<sup>th</sup> week;

- a) Illustrate the product structure for a wooden stool. (3 marks)
  - b) Prepare a Material Requirement Plan (MRP) to determine when orders should be released for stools, stool tops, legs, nails and the size of those orders. Use the provided MRP format. (15 marks)
- 2) Banuka owns a fiber creation house. The annual demand of fiber wall art is 12,480. This business operates 52 weeks per year. Saman estimates his ordering cost at Rs. 5,000. Annual holding cost is Rs. 300 per unit and lead-time is 2 weeks. Using the information given;
- a) Calculate the Economic Order Quantity (EOQ). (3 marks)
  - b) Calculate the total annual costs using the EOQ. (5 marks)
  - c) Determine the reorder point. (2 marks)
- (25 marks)**

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