UNIVERSITY OF RUHUNA
FACULTY OF GRADUATE STUDIES
Master of Business Administration Degree Programme Semester II
Examination (July 2020)
Academic Year 2019/2020

PDBA/MBA 108: Operations Management   Duration:Three hours

Calculators are allowed.

The Question Paper contains seven (07) questions.

Answer only Five (05) Questions.

Q1

i.   Briefly explain operations as a transformation process.

(04 marks)

ii. Explain how organizations achieve competitive advantage through operations.

(08 marks)

(Total 12 marks)

Q2

i.   A food manufacturer's marketing department has developed a linear trend equation that can be used to predict annual sales of its product.

$F_t = 150 + 25t$

F_t = Annual sales ('000 units)

t is in years

   a.   Are annual sales increasing or decreasing? By how much?

(02 marks)

   b.   Predict annual sales for year seven (7) using the equation.

(02 marks)

ii. Two different forecasting techniques (F1 and F2) were used to forecast demand for soft drink. Actual demand and two sets of forecasts are as follows.

Period	Demand	Forecasted demand	
		F1	F2
1	74	71	73
2	68	67	65
3	69	72	74
4	80	71	77
5	78	76	81

a. Compute mean absolute deviation (MAD) and tracking signal (TS) for each forecast.

(06 marks)

b. Given your results, which forecast appears to be more accurate? why?

(02 marks)

(Total 12 marks)

Q3

i. XYZ Company sells a particular brand of desktop computers. It costs the firm Rs.500 each time it places an order with the manufacturer for the computers. The cost of carrying one computer in inventory for a year is Rs.250. The store manager estimates that total annual demand for the computers will be 1600 units, with a constant demand rate throughout the year. Orders are received within minutes after placement from a local warehouse maintained by the manufacturer. The store policy is never to have stockouts of the computers. The store is open for 250 days.

Determine the following:

a. Optimal order quantity per order

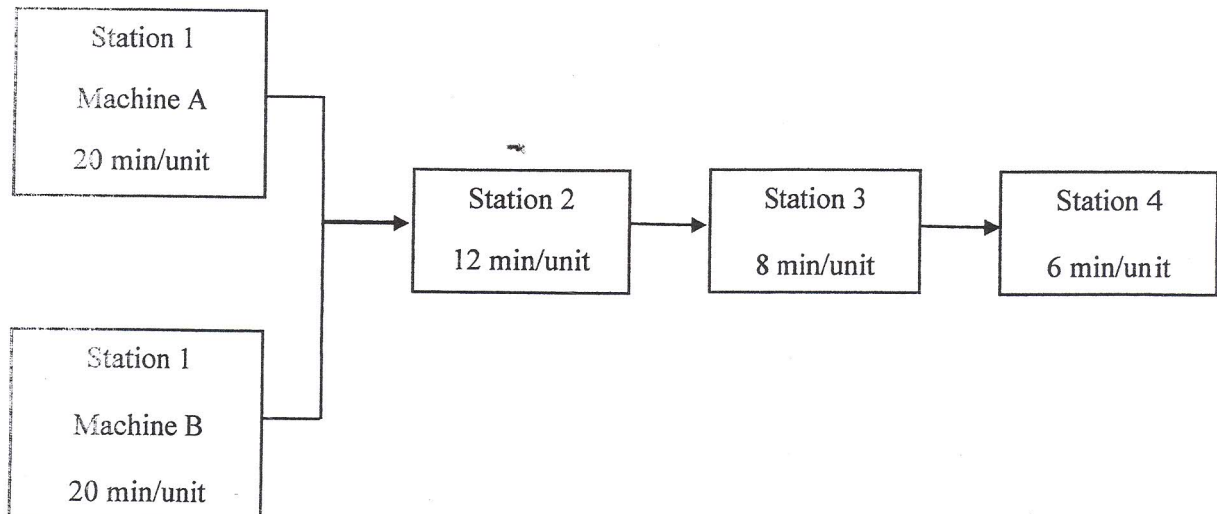(02 marks)

b. Minimum total annual inventory costs

(02 marks)

c. The number of orders per year

(01 mark)

d. The time between orders (in working days)

(01 mark)

ii.   The four-station work cell is at MAC holdings illustrated in the following figure. It has two machines at station 1 in parallel (i.e., the product needs to go through only one of the two machines before proceeding to station 2)

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┌─────────────────┐
│   Station 1     │
│   Machine A     │
│   20 min/unit   │
└─────────────────┘
                        ┌──────────────┐    ┌──────────────┐    ┌──────────────┐
                        │  Station 2   │    │  Station 3   │    │  Station 4   │
                        │              │───▶│              │───▶│              │
                        │  12 min/unit │    │  8 min/unit  │    │  6 min/unit  │
                        └──────────────┘    └──────────────┘    └──────────────┘
┌─────────────────┐
│   Station 1     │
│   Machine B     │
│   20 min/unit   │
└─────────────────┘
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a. What is the throughput time of this work cell?

(02 marks)

b. What is the bottleneck time of this work cell?

(01 mark)

c. What is the bottleneck station?

(01 mark)

d. If the firm operates 8 hours per day,5 days per week, what is the weekly capacity of this work cell?

(02 marks)

(Total 12 marks)

Q4.

i.   Briefly explain what Total Quality Management is, as discussed in your study program.

(10 marks)

ii. Brandi's plant has been designed to produce 8000 units per day, but it is limited to making 6500 units per day because of the time needed to change equipment between styles of products, material delay, employee absences, and other problems. The plant has an effective capacity of 7000 units per day. Calculate the utilization and efficiency of this system.

(02 marks)

(Total 12 marks)

Q5

i. The Wattson Light Company produces incandescent light bulbs. Table 1 shows the data collected on the number of lumens for 40-watt light bulbs, when the process was in control.

Table 1- Number of lumens for 50-watt light bulbs

Sample	Observation			
	1	2	3	4
1	605	592	601	599
2	601	605	604	602
3	589	578	592	598
4	618	612	604	601
5	589	613	610	608

Table 2- Control chart constants

| Sample size (n)	Factor for UCL and LCL for $\bar{X}$ chart (A2)	Factor for LCL for R- chart (D3)	Factor for UCL for R- chart (D4)
2	1.880	0.00	3.267
3	1.023	0.00	2.575
4	0.729	0.00	2.282
5	0.577	0.00	2.115
6	0.483	0.00	2.004
7	0.419	0.076	1.924
8	0.373	0.136	1.864
9	0.337	0.184	1.816
10	0.308	0.223	1.777

You are required to;

    a. Calculate control limits for an R- chart and an $\bar{X}$ chart.

                          (06 marks)

    b. Since these data were collected, some new employees were hired. A new sample obtained the following readings: 621, 612, 608, and 619. Is the process still in control?

                          (04 marks)

ii. A production line has four machines A, B, C, and D with reliabilities of .98, .96, .95, and .93, respectively. The machines are arranged so that if one breaks down, the others must shut down. Engineers are considering an alternative design for increasing the line's reliability. An alternative design involves providing a backup for each machine with reliabilities equal to the original four.

    a. Calculate system reliability without backups.

                          (01 mark)

    b. Calculate system reliability of an alternative design (with backups).

                          (01 mark)

                      (Total 12 marks)

Q6

The demand for subassembly S is 100 units in week 7. Each unit of S requires 1 unit of T and 2 units of U. Each unit of T requires 1 unit of V, 2 units of W, and 1 unit of X. Finally, each unit of U requires 2 units of Y and 3 units of Z. One firm manufactures all items. It takes 2 weeks to make S, 1 week to make T, 2 weeks to make U, 2 weeks to make V, 3 weeks to make W, 1 week to make X, 2 weeks to make Y, and 1 week to make Z.

Item	On hand
S	25
T	-
U	50
V	30
W	40
X	25
Y	110
Z	25
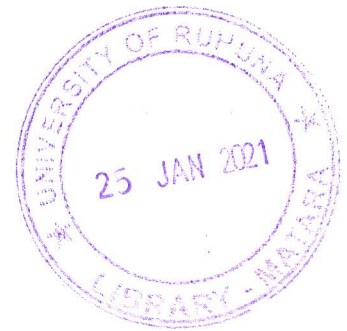
a. Construct a product structure.

(02 marks)

b. Construct a material requirement plan using lot for lot rule.

(10 marks)

(Total 12 marks)

Q7

The following set of activities and precedence relationships have been developed with respect to a project.

Activity	Predecessor(s)	Time (days)
A	-	6
B	A	7
C	A	8
D	B , C	4
E	B	6
F	E , D	5
G	F	2

a. Draw a project network diagram for the above project.   (02 marks)

b. What is the critical path?   (04 marks)

c. What is the project duration in days?   (02 marks)

d. Calculate slack of each activity of the project.   (04 marks)

(Total 12 marks)

List of formulae

$$TS = \frac{Cummulative\ error}{MAD}$$

$$TS = \frac{\sum(D_i - F_i)}{(\sum |D_i - F_i|/n)}$$

$$EOQ = \sqrt{\frac{2DS}{H}}$$

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