	UNIVERSITY OF RUHUNA FACULTY OF MANAGEMENT AND FINANCE	No. of Pages : 05 No. of questions : 06 Total Marks : 70
BACHELOR OF BUSINESS ADMINISTRATION HONOURS DEGREE 2000 LEVEL SECOND SEMESTER END EXAMINATION – FEB/MARCH 2025		Three Hours

BBA 22023 – Operations Management **Academic Year: 2024/2025**

Instructions

- This paper contains six (06) questions
- Answer five (05) questions only.
- For the computation, the final answer should be rounded off to two decimal places where necessary.
- Calculators are permitted

01. I. The student study fee at Augsburg International School is Rs. 15,000.00 for each module for primary grade students and Rs. 25,000.00 for Secondary grade per student in a term. The class size for primary grades is 40 students and 50 students for secondary grades. There are two classes for each grade, primary grades have classes for grades 1 – 5, and secondary grades have classes for grades 6 -11.

Labor cost is Rs. 130.00 per student, material costs are Rs. 35.00 per student and the overhead cost is Rs. 15,400.00 per class. The cost of an indoor sports room is Rs. 50.00 for each secondary grade student and primary grade students usually use only the outdoor playground for their sports.

a) What is the multi-factor productivity of primary grade students at Augsburg International? [02 Marks]

b) If a teacher works for 6 hours per day and around 20 days per month, calculate the labor productivity of a teacher who works in a primary and secondary grade class. [02 Marks]

II. Superlight is a leading clothing soap that shows high popularity and demand in the market. What are order qualifiers and order winners of Superlight to achieve competitive advantages over competitors? [04 Marks]

III. Leoch Batteries Pvt Ltd. has recently been receiving complaints from retailers that its 9-volt batteries do not last as long as other brands. Mr. Sarath, head of the TQM program at Leoch's up-country plant, believes there is no problem because their batteries have had an average life of 50 hours, which is approximately 10% longer than competitors' products. However, increasing the battery lifespan beyond this level would require advanced technology that Leoch currently does not possess. Nevertheless, he is concerned enough to implement hourly assembly line checks. Mr. Sarath collected samples of size n = 55 from 9-volt batteries over the next 10 hours to establish standards for control chart limits. The data from these samples is presented in the following table.

Hour Sample Taken	Sample				
	1	2	3	4	5
1	51	50	49	50	50
2	45	47	70	46	36
3	50	35	48	39	47
4	55	70	50	30	51
5	49	38	64	36	47
6	59	62	40	54	64
7	36	33	49	48	56
8	50	67	53	43	40
9	44	52	46	47	44
10	70	45	50	47	41

(**Note**: The mean factor for sample size 5 is 0.58 and for sample size 10 is 0.31)

a) Develop X bar chart to determine whether the battery's lifetime has been reduced. [04 Marks]

b) State whether the battery manufacturing process is in control. [02 Marks]

[Total = 14 Marks]

02. I. Briefly explain the key aspects that managers must consider when designing a good layout.

[04 Marks]

II. The following table illustrates the tasks involved in assembling electronic components, the time required for each task, and the operations that must be completed before subsequent tasks.

Work Task	Task Time (Minutes)	Task Predecessor (s)
A	6	-
B	5	A
C	6	A
D	4	B
E	6	B
F	6	C, E
G	3	D
H	2	D
I	4	G, H
J	5	I, F

You are required to,

a. Construct a precedence diagram for the assembly of electronic components.

[02 Marks]

b. Calculate the process flow time and the desired cycle time needed to produce 150 components in a 50-hour week. [02 Marks]

c. Determine the minimum number of workstations required for this assembly line.

[02 Marks]

d. Assign the tasks to suitable workstations in a circular layout, ensuring task dependencies are followed. [02 Marks]

e. Balance the line and calculate its efficiency. [02 Marks]

[Total = 14 Marks]

03. I. Mr. Peter is willing to start a new business in a selected town in an urban area. As a student who has studied Operations Management, what are the steps you suggest that Mr. Peter should consider when he selects a new facility to establish the site?

[04 Marks]

II. The Global Parcel Service wants to build a new distribution center in Kandy, Kurunegala, and Kegalle. The center needs to be vicinity of uncongested areas of Ka1, Ku2, and Ke3. The coordinates of these three sites and the number of weekly packages that flow to each are as follows.

Ka1	Ku2	Ke3
X=12	X=15	X=18
Y=24	Y=19	Y=20
W=17000	W=12000	W=9000

Determine the best site location using the center of gravity technique. [04 Marks]

III. A manufacturing firm has the following inventory details for the year 2024. The firm operates 50 weeks per year and has a cost of goods sold (COGS) of Rs. 4,750,000.00 The inventory is categorized into raw materials, work in process, and finished goods as shown below.

Category	Part Number	Average Inventory Units	Unit Value (LKR)
Raw Material	1	20,000	4.50
	2	3,500	6.00
	3	4,000	2.00
Work in Progress	4	6,000	15.00
	5	5,000	20.00
Finish Goods	6	3,000	50.00
	7	1,500	70.00

The firm management decided to reduce its inventory holding cost by 15% in the year 2025.

a) What is the target average aggregate inventory value for the year 2025? [02 Marks]

b) How does the company management decision impact the percentage change in the inventory turnover ratio? [02 Marks]

c) What will be the firm's projected weeks of supply from 2025 onward? [02 Marks]

[Total = 14 Marks]

04. I. Mr. Nimal owns a juice bar that specializes in making fresh smoothies for customers. The bar has two identical smoothie preparation stations. A customer first places an order, which takes 25 seconds. The order is then sent to one of the two stations. Each station has two workers and three operations:

- Preparation Worker 1 retrieves and cuts the fruits (18 seconds/smoothie).
- Preparation Worker 2 adds liquid ingredients and blends the smoothie (25 seconds/smoothie).
- The blender processes the smoothie (30 seconds/smoothie).

Finally, another employee pours the smoothie into a cup, seals it, and hands it to the customer (40 seconds/smoothie).

Mr. Nimal wants to determine,

a) What is the bottleneck and bottleneck time of this process? [02 Marks]

b) What is the total throughput time for one smoothie? [02 Marks]

II. Mr. Fernando owns a furniture workshop that manufactures wooden tables (A). To produce one table (A), the following components are required:

B: Table Frame (requires E: 2 Wooden Planks and F: 4 Screws)

C: Tabletop

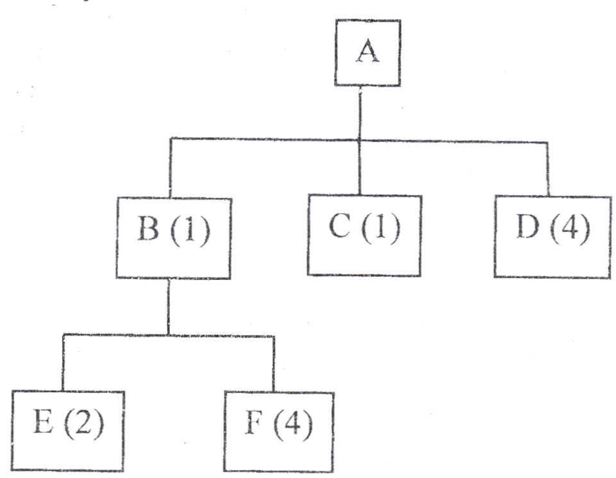
D: 4 Table Legs

Lead Times

- A 1 day
- B 1 days
- C 4 days
- D 3 days
- E 2 days
- F 1 day

Demand

- Day 10 10 A
- Day 6 5 B (Spares)
- Day 9 20 F (Spares)



Prepare a material requirement plan (MRP) for the ten-day planning horizon based on the information provided above. [10 Marks]

[Total = 14 Marks]

05. I. Briefly explain the two general approaches to forecasting with the methods. [04 Marks]

II. A contractor has five jobs awaiting processing. Processing time and due dates are given in the following table. Assume that jobs arrive in the order shown. The start date is day 0.

Job	Processing Time	Due Date
A	5	9
B	2	7
C	7	10
D	4	5
E	3	6

a. Schedule the above jobs by using the shortest processing time (SPT) and Slack time remaining (STR). [05 Marks]

b. Calculate the mean flow time and mean tardiness of the five jobs under each sequencing rule. Which rule would you recommend?

[05 Marks]

[Total = 14 Marks]

06. I. What do you mean by the bullwhip effect and suggest four strategies a company can implement to minimize the bullwhip effect. [04 Marks]

II. As a newly appointed Operations Manager of a recently established apparel manufacturing company, your initial task is to identify and eliminate inefficiencies to implement lean production effectively. Describe Taiichi Ohno's seven wastes with specific examples in your apparel company. [04 Marks]

III. A manufacturing company produces a single product line with the following monthly production requirements (in units).

Months	January	February	March	April	May	June
Units	10,500	9,300	11,200	4,500	5,500	7,200
Production Dates	20	21	22	20	22	21

Each unit requires 1 hour and 15 minutes of production time. Additional company data includes:

- Initial Inventory: 500 units
- Workforce: 45 workers, each working an 8-hour shift per day
- Operational Constraints:
  - Maximum workforce: 55 workers
  - Overtime limit: 25% of regular production hours
- Cost Structure:
  - Labor: 18 Rs/hour
  - Overtime: 27 Rs/hour
  - Subcontracting: 65 Rs/unit
  - Idle time: 22 Rs/hour
  - Inventory holding: 5 Rs/unit
  - Backorder: 28 Rs/unit
  - Hiring: 550 Rs/worker
  - Firing: 850 Rs/worker

Determine the production cost using a level-demand approach. Hiring and firing employees is allowed as needed. Assume initial inventories and overtime hours are available to utilize, but subcontracting is not permitted.

[06 Marks]

[Total = 14 Marks]

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