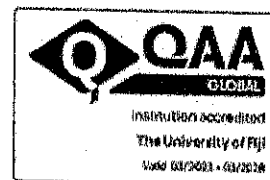




The University of Fiji
(An Entity of Arya Pratinidhi Sabha of Fiji)



SCHOOL OF BUSINESS AND ECONOMICS
Semester 2, 2025

FINAL EXAMINATION PAPER

**MGT203: OPERATIONS AND SUPPLY CHAIN
MANAGEMENT**

Important Instructions to Students

1. Read the questions, instructions carefully and answer the questions.
2. You are allowed an **extra 10 minutes reading time** (during this time, you are not allowed to write with pen) and **180 minutes (3 Hours) to complete this paper**.
3. Silent, non-programmable calculators are allowed, but not supplied.
4. Write all your answers in the answer booklet provided. If you need extra sheets, please ask from the supervisor. Write your name, course code and student identification number in the answer booklet and in the attendance sheet.
5. This paper contains seven (7) questions. All questions are compulsory to answer.
6. Write all your answers legibly. The marker has the right to award zero for answers that are not legible.
7. This is a **Closed Book Examination**. The University views plagiarism, cheating and dishonest practice as serious offences and if found, offenders are penalized.

Examination Paper Content (Format)

Question No.	Content	Marks	Suggested Time
1	Theory	24	44
2	Productivity Measurement	10	18
3	Decision Analysis	10	18
4	Statistical Process Control	15	27
5	Cost Profit Volume Analysis	13	23
6	Forecasting	13	23
7	Inventory Management	15	27
TOTAL		100	180 Minutes

Answer any 3 out of 6 questions. Each question is worth 8 marks.

(Note: You need to write at least half a page for each of the question)

- (a) The management literature highlights a number of total quality management (TQM) tools to effectively measure and improve the quality of its products on an ongoing basis. Using relevant examples, discuss the benefits of using '**Cause and Effect**' diagram in the production department.
- (b) You have recently been appointed the supervisor of the warehouse in the Nadi branch. Within your first week at work, you discovered the warehouse is in a mess and this is affecting staff productivity and resulting in continuous delays in meeting customer orders. Using the '**5S concept**' from lean production, explain the process you would follow to improve staff productivity and overall efficiency.
- (c) The objective of the product strategy is to develop and implement a new product that meets the demands of the marketplace with a competitive advantage. Using a local organisation of your choice, discuss the process an operations manager needs to follow to successfully develop and introduce a new product in the market.
- (d) With reference to supply chain management, discuss at least 3 advantages and 3 disadvantages of outsourcing.
- (e) Manasa has just commenced a furniture business and would like to implement total quality management (TQM) concepts. Discuss how Manasa could implement any 4 of the 7 TQM concepts in his business.
- (f) 'Poor classification of inventory in business organisation often results in increased labour cost and loss of market share.' Evaluate this statement and discuss the benefits of using ABC method of inventory classification for a hardware company of your choice.

(8 + 8 + 8 marks)

QUESTION 2**Productivity Measurement****(10 marks)**

Viti Garments Limited uses total factor productivity index to measure the productivity of its production department on a weekly basis. The data for week 4 of October 2025 are as follows:

- Number of pair of sports uniforms produced = 600
- Total labour hours used = 1,200
- Total machine hours used = 600
- Overhead cost incurred for the production of sports uniform = \$2,500

Additional Information

- The value of each pair of sports uniform before mark-up = \$30.00
- Labour cost per hour = \$ 5.50
- Cost per machine hour = \$ 4.00

Required

- (a) Calculate the labour productivity (sports uniform produced per labour hour).
- (b) Calculate the total factor productivity index for week 4, October 2025.
- (c) Based on the total factor productivity index for weeks 1-3 below, comment on the index calculated in part (b) above.

	Week 1	Week 2	Week 3
Multi-factor Productivity Index	1.65	1.75	1.70

- (d) Calculate the increase required in the value of input for the pair of sports uniform to achieve a total factor productivity index of 1.80 for Week 4, October 2025.

(2 + 4 + 2 + 2 marks)

QUESTION 3**Decision Analysis****(10 marks)**

The management of a popular chain of supermarket in the Western division are exploring the possibility of opening a new branch in the populated area of Votualevu, Nadi. The research & development team has provided the projected profit / (loss) for different business sizes based on market conditions.

Business Options	Market Conditions		
	Good (\$)	Average (\$)	Bad (\$)
Small	400,000	250,000	50,000
Medium	600,000	400,000	150,000
Large	800,000	500,000	(50,000)
Very Large	1,000,000	700,000	(500,000)

Required

(a) Using appropriate calculations, recommend to the management the business options for consideration under the following criteria:

- (i) Maximax
- (ii) Maximin
- (iii) Equally Likely

(b) Discuss at least 3 other factors you would suggest to the management to consider before opening a new branch in the populated area of Votualevu, Nadi.

(6 + 4 marks)

QUESTION 4**Statistical Process Control****(15 marks)**

Southern Rice Company Limited supplies 45 kilograms (kg) bag of rice to the local market. The operations manager would like to ensure the production is in control. The operations manager took a sample of 8 bags of rice every day for the past 8 days and recorded the average weight in kilograms. The table below summarizes the analysis.

Days	1	2	3	4	5	6	7	8
Sample Average (kg)	43.50	43.80	45.25	44.30	44.75	45.40	45.00	44.00
Sample Range (kg)	1.25	1.00	0.80	1.20	1.50	1.20	1.40	1.25

Required

- Calculate the grand mean and average range for the past 8 days.
- Using the table below and the formulas provided, calculate the LCL_x (lower control limit: mean) and UCL_x (upper control limit: mean).
- Draw the mean control chart and explain whether the process is in control.
- Using illustrative examples, explain some of the practical solutions to ensure the production is maintained within the control limits on an ongoing basis.

Sample Size n	Mean Factor A_2	Upper Range D_4	Lower Range D_3
2	1.880	3.268	0
3	1.023	2.574	0
4	.729	2.282	0
5	.577	2.115	0
6	.483	2.004	0
7	.419	1.924	0.076
8	.373	1.864	0.136
9	.337	1.816	0.184
10	.308	1.777	0.223
12	.266	1.716	0.284

(2 + 6 + 4 + 3 marks)

QUESTION 5**Cost Volume Profit Analysis****(13 marks)**

Lako Tu Manufacturing Company Limited specialises in the production of sandals for the local and export market. The production cost for the next financial year is as follows:

- Selling price per product = \$50 (to wholesalers)
- Variable cost per product = \$22
- Fixed cost = \$500,000

Required**Part A**

- (i) Calculate the contribution margin per unit.
- (ii) Calculate the breakeven point in units.
- (iii) Calculate the expected profit if the company is planning to sell 30,000 units next year.
- (iv) Calculate the number of units required to be sold if the company targets to make a profit of \$400,000.

Part B

Based on the latest forecast on the economic outlook of Fiji, the following changes are expected to take place:

- Selling price per unit is expected to increase to \$60 (to wholesalers)
- Variable costs per unit are expected to increase by \$5
- Fixed costs are expected to increase to \$570,000

Calculate the following:

- (v) Revised contribution margin per unit.
- (vi) Revised breakeven point in units.

(2 + 2 + 2 + 3 + 2 + 2 marks)

QUESTION 6**Forecasting****(13 marks)**

Babasiga Manufacturing Company Limited specialises in the production of bottled beverages made from local fruits and vegetables for the Vanua Levu market. Prior to April 2025, the company used 3 months simple moving average to determine the monthly forecast. The mean absolute percentage error (MAPE) for the 3-month simple moving average has been in the range of 7.0% to 8.0%.

However, from April 2025, the management decided to change the forecasting method to 3 months weighted moving average (weights assigned: 3, 2, and 1 from most recent months).

	Apr 25	May 25	Jun 25	Jul 25	Aug 25	Sep 25	Oct 25
Actual (units)	2,400	2,700	2,900	3,000	3,100	3,200	3,300

Required

(a) Using the historical data given from Apr– Oct 2025, determine the monthly forecast using 3 months weighted moving average with the given weights.

(b) Calculate the forecasted error and mean absolute percentage error (MAPE) for 3 months weighted moving average.

(c) Using appropriate calculations, advise the management whether their decision to change the forecasting method was justified.

(d) Forecast the demand for November 2025 using the 3 months weighted moving average.

(4 + 4 + 3 + 2 marks)

City Hardware Limited has a demand of 50,000 units for product ABX each year. The cost per unit is \$25. It costs City Hardware Limited \$20 to place an order while the carrying cost is 8% per unit.

Required

(a)

- (i) Calculate the Economic Order Quantity (EOQ) for product ABX (round up your answer to the nearest whole number).
- (ii) Calculate the total annual inventory cost.
- (iii) Calculate the total cost.

(b) Determine the reorder point if the company operates for 365 days in a year with a lead time of 5 days.

(c) Independent to your calculation in part (a), evaluate the two offers from Company X and Y with regards to bulk ordering and advise the management accordingly.

- Company X: Order 3,000 quantities of product ABX and get 3% discount.
- Company Y: Order 4,000 quantities of product ABX and get 2% discount.

(d) Apart from cost savings, discuss at least 3 other factors City Hardware Limited needs to consider before accepting the bulk orders.

(2 + 2 + 2 + 2 + 4 + 3 marks)

The End

Formulas

1. Productivity = Output / Input
2. VPI = Expected Value Under Certainty – Maximum EMV
3. P - Chart Formula

$$UCL = \bar{p} + z\sigma_p$$

$$LCL = \bar{p} - z\sigma_p$$

z = number of standard deviations from process average

$\bar{p}$ = sample proportion defective; an estimate of process average

σ_p = standard deviation of sample proportion

$$\sigma_p = \sqrt{\frac{p(1-p)}{n}}$$

4. C- Chart Formula

$$UCL = \bar{c} + z\sigma_c \quad \sigma_c = \sqrt{\bar{c}}$$

$$LCL = \bar{c} - z\sigma_c$$

Where
 $\bar{c}$ = number of defects per sample

5. X-Chart

$$UCL = \bar{\bar{x}} + A\bar{R} \quad LCL = \bar{\bar{x}} - A\bar{R}$$

Where
 $\bar{\bar{x}}$ = average of sample means

6. R-Chart

$$UCL = \bar{R} + D_4\bar{R} \quad LCL = \bar{R} - D_3\bar{R}$$

$$\bar{R} = \frac{\sum R}{k}$$

Where
 $\bar{R}$ = range of a given sample
 k = number of samples

7. Contribution Margin Per Unit = Selling Price Per Unit – Variable Cost Per Unit

8. Contribution Margin = Total Revenue – Total Variable Cost

9. Breakeven (Units) = Total Fixed Cost / Contribution Margin Per Unit

10. Achieve Desired Profit (Units) = (Total Fixed Cost + Desired Profit) / Contribution Margin Per Unit

11. Exponential Smoothing Method: New Forecast

$$= \text{Last period's forecast} + \alpha(\text{Last period's actual demand} - \text{Last period's forecast})$$

12. Optimal Number of Orders = Annual Demand/EOQ

13. Optimal Number of Orders between any two Orders = $\frac{\text{Number of Working Days in a Year}}{\text{Optimal Number of Orders}}$

14. Reorder Point = (Demand/Number of Operating Days in a Year) x Lead Time in Days

- 15.

$$Q^* = \sqrt{\frac{2DS}{H}}$$

16. Inventory Costs = $\frac{D}{Q} \times S + \frac{Q}{2} \times H$

17. Total Cost

$$TC = \frac{D}{Q} \times S + \frac{Q}{2} \times H + PD$$

