NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY

FACULTY OF ENGINEERING

DEPARTMENT OF INDUSTRIAL AND MANUFACTURING ENGINEERING

Bachelor of Engineering Honours Degree Industrial and Manufacturing Engineering

OPERATIONS MANAGEMENT/PRODUCTION PLANNING AND CONTROL

EIE 5112 / TIE 5102

FIRST SEMESTER EXAMINATION

DECEMBER 2024

This examination paper consists of 5 pages.

Time Allowed:	**3 hours**
Total Marks:	**100**
Special Requirements:	**Nil**
Examiner's Name:	**Eng B. Sarema**
External Examiner:	

INSTRUCTIONS TO CANDIDATE

1. Answer only **five (5)** questions.
2. Each question carries 20 marks.
3. This paper contains six (7) questions.

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Question 1

(a) Define operations management. [3]

(b) State any five objectives of operations management. [5]

(c) Explain the similarities and differences between service and manufacturing organisations, giving relevant examples where appropriate. [6]

(d) The National University of Science and Technology aspires *"To be a world-class University in science, technology, innovation, entrepreneurship and business development, spearheading industrialisation locally and beyond."* as shown by its vision statement. Discuss how the implications of this vision statement to its processes. [6]

Question 2

(a) State the three different levels of decision-making in an organisation. [3]

(b) Define the following terms as used in operations management;

(i) Design Capacity, [1]

(ii) Utilisation, [1]

(iii) Rated Capacity, and [1]

(iv) Efficiency. [1]

(c) The design capacity for engine repair at ZUPCO workshops is 80 buses per day. The effective capacity is 40 engines per day and the actual output is 36 engines per day. Calculate the utilization and efficiency of the operation. If the efficiency for next month is expected to be 82%, Calculate the expected output. [4]

(d) Explain how the following organisations adjust to the daily fluctuations in demand.

(i) Airlines, [3]

(ii) Restaurants, and [3]

(iii) Dentists. [3]

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Question 3

(a) Describe the production planning function at the three levels of management. [4]

(b) Discuss in detail the Customer Order Decoupling Point (CODP) and its possible positions. [8]

(c) A manufacturer of gas stoves is considering 3 locations, A, B and C, for a new plant. The cost studies indicate that fixed costs per year at the sites are \$10000, \$20000 and \$45000, respectively. The variable costs per unit are \$60, \$40 and \$20, respectively. The expected selling price for each stove produced is \$150. Find the most economical location with an expected value of 30000 units annually. [8]

Question 4

(a) What is productivity? [2]

(b) A Financial Institution Pvt Ltd offers loans to civil servants. The loan processing involves inquiry by customers, completion of application form, loan approval and loan disbursement. The company wishes to improve the productivity of its operations and engages you as a Consultant. Present a report to the management of the company on the steps that can be taken to measure and improve the productivity of the operations as well as the recommended Key Performance Indicators (KPIs). [14]

(c) Nato Meals Company produces 2000 plates of meals per day. It has been established that the labour costs are \$160, material costs are \$50 and overhead costs are \$320. Determine the multifactor productivity for the company. [4]

Question 5

(a) Differentiate between the reactive and proactive approaches to forecasting, stating examples where each type can be used. [6]

(b) Give specific weaknesses of the following approaches to developing a forecast.

(i) Salesforce composite [2]

(ii) Committee of executives [2]

(iii) Consumer surveys [2]

(c) Your company made a significant effort to improve productivity in the previous year. During the first month, a slight improvement was made. However, major gains exceeding 20 % have recently been made in the packaging and equipment repair departments. You would like to commend your team for the achievements and announce to the other departments that gains

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are possible. You are also aware that some production employees believe that significant gains in productivity mean the loss of some jobs because the company can achieve the same output with fewer employees. Another company laid off 5 % of its workforce shortly after announcing productivity gains. Nonetheless, you believe that increased demand will be able to capture a large market share. You believe that increased demand will more than offset productivity gains and may even require hiring more employees. Naturally, you cannot guarantee this, although you are optimistic about the chances that this will occur. Write a one-page memo to the employees that covers these points. [8]

Question 6

(a) Explain how the following tactics are used in matching demand to capacity during aggregate planning;

(i) Pricing and Promotion [2]

(ii) Fixed workforce [2]

(iii) Variable workforce [1]

(iv) Inventory [1]

(v) Backordering [2]

(vi) Subcontracting [2]

(b) Brocrean Industries produces products X and Y, with demand and product structure shown in Table Q6 and Figure Q6, respectively. The on-hand inventories are as follows; $X = 100$, $Y = 30$, $A = 70, B = 0, C = 200$ *and* $D = 800$. The lot size for A is 250, and the lot size for D is 1000; all other quantities are specified on a lot-by-lot basis. The scheduled receipts for 250 units for X are due in period 2. Determine the order quantities and order release dates for all requirements using an MRP format. [10]

Note: safety stock amounts are to be included in the on hand/available.

Table Q6: Product demand schedule

Products	Demand in Period							
	1	2	3	4	5	6	7	8
X			300			200		250
Y							400	

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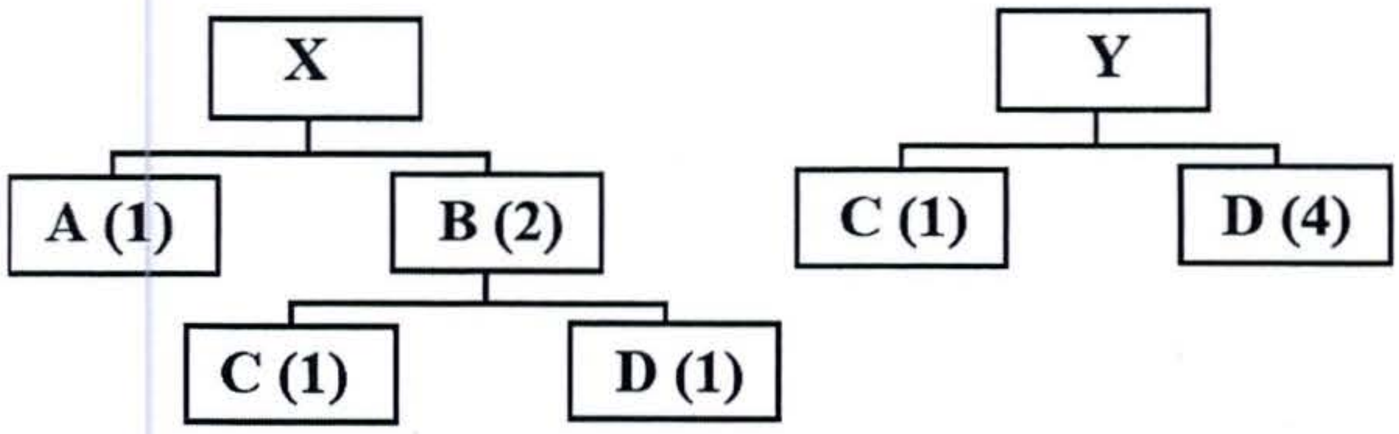

Figure Q6: Product structure

Question 7

(a) Explain the items that can be considered as inventory in production management. [3]

(b) Describe different costs associated with inventory. [7]

(c) A toy manufacturer uses 48 000 rubber wheels per year for its popular dump truck series. The firm makes its own wheels, which it can produce at a rate of 800 per day. The toy trucks are assembled uniformly over the entire year. Carrying cost is $1 per wheel per year. Setup cost for a production run of wheels is $45. The firm operates 240 days per year. Determine the following;

(i) Optimal run size [3]

(ii) Minimum total annual cost for carrying and setup [2]

(iii) Cycle time for the optimum run size [3]

(iv) Run time [2]

End of Examination

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