NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY

FACULTY OF ENGINEERING

'ARTMENT OF INDUSTRIAL AND MANUFACTURING ENGINEERING

MENG MANUFACTURING SYSTEMS/ENGINEERING & OPERATIONS MANAGEMENT

OPERATIONS MANAGEMENT

TIE 6134

STAGE 1 EXAMINATION

SEPTEMBER 2024

This examination paper consists of **2** printed pages

Time Allowed: **3 HOURS**

Total Marks: **100**

Examiner's Name: **ENG MUNYAU**

INSTRUCTIONS AND INFORMATION TO CANDIDATE

1. Answer any FIVE **(5)** Questions.
2. Each Question carries a total of 20 Marks.
3. Start the answer to each full question on a fresh page.
4. Ensure neatness and legibility of work.
5. Use of calculators is permissible.

QUESTION 1

a) In view of globalization, discuss the appropriate Operations Strategies that should be used by a selected sector (select one manufacturing sector) of the manufacturing industry in Zimbabwe

[12]

b) What challenges are in these strategies and how can they be overcome? **[8]**

QUESTION 2

a) Explain the importance of understanding the product life cycle stages in developing effective product strategies, including how each stage impacts marketing, production, and innovation decisions **[6]**

b) Highlight the differences between Artificial Intelligence (AI) and Expert Systems **[2]**

c) Explain the major components of an Expert System clearly indicating the function of each component.

[4]

d) What are the advantages of expert systems in strategic planning? **[4]**

e) An organisation's retail store locations are at A, B, C, D, E, and F, with demands as shown in Table 2.1. Assuming rectilinear distance, determine the best location for a "central" warehouse using the Centre of gravity method.

[4]

Table Q2: Demand and locations for retail stores

Retail Store (Location)	Demand
A (60,95)	400
B (80,75)	300
C (30,120)	200
D (190,110)	100
E (127,130)	300

F (65,40)	100

QUESTION 3

a) Indicate the impact of each of the following factors affecting Production and Operations Management today.

i. Global Competition, **[5]**

ii. Advanced Production technology and **[5]**

iii. Social Responsibility Issues. **[5]**

b) Explain the impact of Operations Management in mitigating against the factors in Qu.3(a) above.

[5]

QUESTION 4

(a) Explain the motivation of Strategic Alliances in the Reality of Global Competition. **[10]**

(b) Stateless corporations is a development in resolving global competition. Explain, using any example how this would benefit the corporations. **[10]**

QUESTION 5

(a) Describe how any three Lean Manufacturing principles that are used to achieve improved performance in terms of efficiency, productivity, and waste reduction. **[12]**

(b) What are the major reasons for failure to successfully implement Lean Manufacturing principles in Zimbabwe and how can these challenges be addressed? **[8]**

QUESTION 6

(a) Explain the various strategies for managing capacity fluctuations in Aggregate Production Planning, including trade-offs between them. **[10]**

(b) A firm producing laptops is expected to deliver 200 laptops in week 1, 300 in week 4, 350 in week 6, and 250 in week 8. Each laptop requires one motherboard, one hard drive and one

batter pack. Orders quantities, lead times, and inventories on hand at the beginning of period 1 are shown in Table Q6.

Table Q6: Computer parts data

Part	Order Quantity	Lead Time	Inventory on hand
Motherboard	500	3 Week	150
Hard drive	400	2 Week	150
Battery Pack	600	1 Week	50

Given that 120 motherboards are also needed in period 5 for a tablet computer shipment and a shipment of 250 hard drives are already scheduled to be received at the beginning of week 2, Compute the Materials Requirements Planning to satisfy the Master Production Schedule. **[10]**

QUESTION 7

The major jobs to be completed in constructing a house, with their immediate predecessors and estimated time durations(days) are listed in Table Q7.

Table Q7: Activity chart for house construction

Job	Description	Immediate Predecessors	Duration
1	Clear Site	-	2
2	Pour slab	1	1
3	Erect frame	2	2
4	Erect roof	3	3
5	Fasten wall panels	4	2

6	Plaster walls	5	2
7	Install window + door frames	3	2
8	Finish carpentry	6,7	6
9	Vanish panels	8	3
10	Install plumbing	9	1
11	Lay bathroom tiles	10	2
12	Complete plumping	11	1
13	Lay flooring	12	2
14	Install geyser	5	1
15	Lay brick work	4	3
16	Install roof tiles	3	2
17	Fit gutters	15,16	2
18	Paint fittings	17	2
19	Insulate attic	6,15	1
20	Construct driveway	15	1
21	Land scaping	20	1
22	Install electrical fittings	14	1
23	Test electrical circuit	22	1
24	Cleaning	13,18,19,23	1
25	Finishing	21,24	1

(a) Draw the activity network diagram for the project. **[10]**

(b) Calculate, the float times for each activity. **[6]**

(c) Identity the critical path and state the minimum duration of the project. **[4]**

END OF EXAMINATION