NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY

FACULTY OF INDUSTRIAL TECHNOLOGY

DEPARTMENT OF INDUSTRIAL ENGINEERING

OPERATIONS MANAGEMENT I – TIE 5107

1st SEMESTER EXAMINATIONS NOVEMBER/DECEMBER 1999

Time Allowed: 3 Hours

Instructions: Answer FIVE (5) questions in all. Attempt at least ONE question from EACH section. All questions carry equal marks

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SECTION A: STRATEGIC ISSUES

Qu. 1 a) What is the relationship between the mission of a firm and the strategy it adopts? [4]

b) Briefly describe how strategic objectives are transformed into operational objectives. [3]

c) Identify, at least five each, the strategic and tactical decisions of operations management. [5]

d) What do you understand by the term *Competitive Advantage*? [4]

e) Why should external environments be taken into consideration when making decisions in operations management? [4]

Qu. 2 a) Discuss in detail the activities that take place at the following levels of the manufacturing planning hierarchy:

i) The corporate game plan level [3]
ii) The business plan level [3]
iii) The medium term logistics level [3]
iv) The execution plan level [3]

b) "Most firms concentrate on what has to be produced (priority) without ensuring whether the facilities are available to produce them (capacity)." With the aid of a diagram show the capacity decisions required at various levels of the hierarchy of operations management system. [8]

SECTION B: TACTICAL ISSUES

Qu. 3 "The following activities play major roles in production management in developing countries: value chain management; lead time compression; appropriate technology; manufacturing systems; quality issues; ..., contract design; configuration management; concurrent engineering; and change management." Discuss any five of these issues that are relevant to the Zimbabwe manufacturing industry. [20]

Qu. 4 a) With the aid of a diagram, show the external environment of aggregate production planning. [4]

b) Four strategies that are used for aggregate production planning are as follows:

Strategy 1: constant workforce, no overtime, no safety stock and no sub-contracting.

Strategy 2: constant workforce is assumed to be equal to the number of workers corresponding to the least demand per day, while all other demands are met at sub-contracting, with no inventory cost.

Strategy 3: vary workforce by hiring/firing, with production rate taken to be equal to demand forecast.

Strategy 4: constant workforce is decided by the management, while all other demands are met by scheduling overtime.

Discuss the pros and cons of these strategies. [4]

c) Table Qu. 4 (a) shows the sales forecast and available hours for a half-year period. Table Qu. 4 (b) shows the cost information. The operations manager can only consider Strategy 1 and Strategy 2 options in (b) during aggregate production planning. One unit takes 2 hours to produce. Assume 8 working hours per day.

i) Which strategy is preferred and why? [10]
ii) Is a cheaper strategy always better? Support your answer with some reasons. [2]

Table Qu. 4(a): Sales forecast

	Jan	Feb	March	April	May	June
Sales forecast	525	375	450	750	1125	525
Production days	22	19	21	21	22	20

Table Qu. 4(b):	Costs information
Average pay rate	\$6/hour
Overtime pay rate	\$9/hour
Subcontracting cost rate	\$10/unit
Hiring cost	\$9/unit
Firing cost	\$12/unit
Inventory carrying costs	\$5/uni/month

Qu. 5 a) What are the inputs required for generating a master production schedule? [4]

b) Discuss the pros and cons of material requirement planning (MRP) as a planning tool in operations management. [4]

c) Explain the main features of material requirement planning (MRP), manufacturing resource planning (MRP II) and enterprise resource planning (ERP). [4]

d) How has information technology (IT) impacted on MRP II and ERP? [4]

e) Discuss the role of MRP II in concurrent engineering. [4]

SECTION C: TACTICAL & CAPACITY ISSUES

Qu. 6 a) Is the term "scheduling" relevant in assembly line balancing? Explain. [3]

b) How does scheduling differ in a job shop and a flow shop? [3]

c) What is the role of scheduling in operations management? [3]

d) Table Qu. 6 shows the four-job, five-machine flow-shop problem.

i) How many evaluations are required to obtain an optimum solution? [1]

ii) From the following four sequences generated by a heuristic, determine the best makespan for the flow-shop problem: [10]

{3 1 2 4}
{3 1 4 2}
{3 4 1 2}
{4 3 1 2}

Table Qu. 6: Operation times data (minutes)

		Machines (m)				
		1	2	3	4	5
Jobs	1	5	9	8	10	11
(n)	2	9	3	10	1	8
	3	9	4	5	8	6
	4	4	8	8	7	2

Qu. 7 a) What do you understand by the term *resource capacity requirement*? [5]

b) Table Qu. 7 shows the processing times (in minutes) for machines A, B, C, D, E, F, to produce product types 1, 2, 3, 4, 5. Information on the market demand (representing the master production schedule), sales price and material costs are shown on the last three columns. Machine capacities (maximum available times) are shown on the last row.

Determine:

i) whether there is enough capacity to produce the parts. [5]

ii) the feasible maximum total throughput of the system. [10]

Table Qu. 7: Capacity requirements data

Product	machine						Market demand	Sales price $	Material Cost $
	A	B	C	D	E	F			
1	2.5	9.5	6.5	12.0	4.0	30.0	20	30	10
2	5.5	3.5	1.5	16.0	1.0	10.0	30	50	42
3	3.5	8.5	9.5	25.0	2.0	9.0	40	50	25
4	2.0	8.0	10.0	30.0	1.0	10.0	30	40	25
5	10.0	20.0	15.0	0.0	10.0	2.0	60	20	15
Capacity (min)	2400	1825	2400	2400	2400	2400			

End of Exam