08:30 hrs	05/6/07	HALL 29-GF	EXAMS OFFICE USE ONLY

University of the Witwatersrand, Johannesburg

Course or topic No(s)	MECN4000
Course or topic name(s) Paper Number & title	SYSTEMS MANAGEMENT
Examination to be held during month(s) of (*delete as applicable)	JUNE 2007
Year of Study (Arts & Science leave blank)	4TH YEAR
Degree/Diplomas for which this course is prescribed (BSc (Eng) should indicate which branch)	BSc (ENGINEERING) (ELECTRICAL)
Faculty/ies presenting candidates	ENGINEERING
Internal examiner(s) and telephone extension number(s)	MR P ROBERTS (X77320)
External examiner(s)	MR M SHAMLEY
Special materials required (graph/music/drawing paper) maps, diagrams, tables, computer cards, etc.	**TABLES AND FORMULAE SUPPLIED.**

Time allowance

Course Nos.	MECN4000	Hours	2 HOURS

Instructions to candidates (Examiners may wish to use this space to indicate, inter alia, the contribution made by this examination or test towards the year mark, if appropriate)

SEE THE INSTRUCTIONS FOR EACH SECTION

Section A (25 marks) Attempt all questions.

1. Product A is made up of 2 B's and 2 C's. Each B comprises a D and 2 E's. Lead times are 1 week for A, C and E, and 2 weeks for B and D. There are 20 B's on hand in week 1. E's are delivered in batches of 50, and there is a scheduled receipt of 50 E's in week 2.
If there is a gross requirement for 100 A's in week 10, when will the order release for E be placed, and for what quantity?

(4 marks)

2. Explain, *using an appropriate example of each type*, the principal differences between a product layout and a process layout for a production environment.

(2 marks)

3. Briefly discuss the importance of "mass-customization" as a recent development in manufacturing. How does this relate to the traditional 5 (Skinner) competitiveness criteria?

(4 marks)

4. Outline briefly some of the considerations facing operations managers in service industries, as opposed to the more traditional manufacturing environment.

(3 marks)

5. Explain the reasoning behind "pull systems" (in the Lean context). Why are they used?

(4 marks)

6. The following is an extract from a set of data collected for an SPC chart. Five samples of four parts were taken from ongoing production of a metal shaft with target diameter of 10mm and tolerance of +/- 0.1mm. Calculate the upper and lower control limits of the appropriate SPC chart(s).
Comment on the process briefly.

Sample	1	2	3	4
1	9.94	10.01	9.94	10.05
2	9.89	9.97	9.92	10.02
3	10.01	9.86	9.96	10.06
4	10.06	9.89	10.05	10.07
5	9.92	10.05	10.06	9.97

(5 marks)

7. Outline some of the main concerns about ERP/MRP systems, and why they often fail in practice.

(3 marks)

Section B (40 marks) Answer any TWO out of three questions.

1. DaimlerChrysler SA is an example of a large operation using ERP systems (in this case SAP) while implementing Lean Thinking in the operation. Explain carefully how the principles of MRP/ERP systems and Lean Thinking might be combined to maximize operations competitiveness through cost reduction and efficiency improvement, in an operation where suppliers are located locally and overseas. Consider such aspects as inventory, quality, scheduling, ordering of components etc.

(20 marks)

2. Discuss the evolution of the term "Value Stream". Why can it be said that individual firms no longer compete – competition is now between entire value streams?

(20 marks)

3. Explain the importance of "muda" as a cornerstone of lean operations. How does this focus relate to the DMAIC cycle in Six Sigma thinking?

(20 marks)

Section C (35 marks) Attempt all questions

1. Company X manufactures a product (unit cost R20,00) on a 16 hour day, 250 day per year basis. The production rate is 500 units per hour and the average rate of usage in the plant is 5000 units per day. It costs R200 to set up the machine for each run, and 10 cents per day per unit in holding costs. The lead time to set up the production process is two hours. Calculate the optimal production quantity and reorder point.

(8 marks)

2. Using Johnson's Rule, schedule the following tasks through processes 1 and 2 (in that order) in the minimum amount of time. Draw a bar chart to determine how long it will take to process all 6 jobs.

	PROCESS	
TASK	**1**	**2**
A	3 hrs	1 hrs
B	7	4
C	1	2
D	2	0
E	5	5
F	2	3

(5 marks)

3. The quality manager in a chocolate factory notes the number of under- or overweight slabs of chocolate in samples of 300 each. *What type of SPC chart(s) should be used, and why?* Sketch appropriate statistical process control chart(s) (for a 99.7% confidence interval) to advise her whether the process is operating in control. Target mass is 100g +/- 1g.

Sample	Under weight	Overweight
1	3	4
2	5	4
3	2	5
4	4	3
5	4	3
6	5	4
7	3	4
8	5	5
9	4	4
10	6	5
11	4	6
12	3	5
13	5	4
14	2	3
15	1	6

(10 marks)

4. The following tasks must be performed on an assembly line in the sequence and times specified. Daily output must be 440 units in an eight-hour day.

Task	Time (seconds)	Preceding Task
A	45	-
B	40	-
C	25	A
D	45	C
E	20	C
F	25	D
G	20	E
H	45	B, F,G

a) Draw the precedence diagram and calculate the takt/cycle time and theoretical minimum number of workstations. (5 marks)

b) *Use the longest operation time rule* to balance the line, for the minimum number of stations and calculate the time utilization efficiency of your solution. (7 marks)