UNIVERSITY OF SWAZILAND

FACULTY OF COMMERCE

DEPARTMENT OF BUSINESS ADMINISTRATION

MAY EXAMINATION PAPER

MAY, 2010

(FULL TIME / IDE STUDENTS).

TITLE OF PAPER	:	OPERATIONS MANAGEMENT
COURSE CODE	:	BA 513
TIME ALLOWED	:	THREE (3) HOURS
TOTAL MARKS	:	100 MARKS
INSTRUCTIONS	:	(1) TOTAL NUMBER OF QUESTIONS IN THIS PAPER IS SIX (6)
		(2) THE PAPER CONSISTS OF SECTION A AND SECTION B.
		(3) ANSWER THE QUESTIONS IN SECTION A WHICH ARE COMPULSORY AND ANY TWO (2) QUESTIONS IN SECTION B.
		(4) THE MARKS ALLOCATED FOR A QUESTION / PART OF A QUESTION ARE INDICATED AT THE END OF EACH QUESTION / PART OF QUESTION.
		(5) WHERE APPLICABLE, ALL WORKINGS / CALCULATIONS MUST BE CLEARLY SHOWN.

NOTE: MAXIMUM MARKS WILL BE AWARDED FOR GOOD QUALITY LAYOUT, ACCURACY, AND PRESENTATION OF WORK.

THIS PAPER MUST NOT BE OPENED UNTIL PERMISSION HAS BEEN GRANTED BY THE INVIGILATOR.

SECTION A (COMPULSORY) - 50 MARKS

Q1. Manager N. K. Shongwe of Plum Engines, a producer of lawn mowers and leaf blowers, must develop an aggregate plan given the forecast for engine demand shown in the table. The department has a normal capacity of 130 engines per month. Normal output has a cost of E60 per engine. The beginning inventory is zero engines. Overtime has a cost of E90 per engine.

Month	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*
Forecast	*120*	*135*	*140*	*120*	*125*	*125*	*140*	*135*

(a). Develop a chase plan that matches the forecast and compute the total cost of your plan. (10marks).

(b). Compare the costs to a level plan that uses inventory to absorb fluctuations. Inventory carrying cost is E2 per engine per month. Backlog cost is E90 per engine per month. (15marks).

Q2 (a). With the aid of diagram, illustrate the components of *Computer-Integrated Manufacturing (CIM).* (18marks).

(b). What are the problems associated with product life cycle model? (7marks).

SECTION B (ANSWER ANY TWO QUESTIONS)- 50 MARKS

Q3 (a). What is work sampling? How does it differ from time study? (8marks).

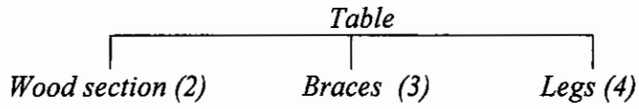
(b). A worker – machine operation was found to involve 3.3 minutes of machine time per cycle in the course of 40 cycles of stopwatch study. The worker's time averaged 1.9 minutes per cycle, and the worker was given a rating of 120% (machine rating is 100%). Midway through the study, the worker took a 10-minute rest break. Assuming an allowance factor of 12% of work time, determine the standard time for this job. (5marks)

(c). In an initial survey designed to estimate the percentage of time air express cargo loaders are idle, an analyst found that loaders were idle in 6 of the 50 observations. Approximately, how many observations would you require to estimate the actual percentage of idle time to within 5% with a confidence of 95%? (6marks).

(d). A job in an insurance office involves telephone conversations with policyholders. The office manager estimates that about half of the employee's time is spent on the telephone. How many observations are needed in a work sampling study to estimate that time percentage to within 6 percent and have a confidence of 98 percent? (6marks).

Q4. A table is assembled using three components, as shown in the accompanying product structure tree. The company that makes the table wants to ship 100 units at the beginning of day 4, 150 units at the beginning of day 5, and 200 units at the beginning of day 7. Receipts of 100 wood sections are scheduled at the beginning of day 2. There are 120 logs on hand. An additional 10% of the order size on logs is added for safety stock. There are 60 braces on hand with no safety stock requirement for braces. Lead times (in days) for all items are shown in the following table.

Quantity	*Lead Time*
1 - 200	*1*
201 – 550	*2*
551 – 999	*3*



Prepare a material requirements plan using lot-for-lot ordering. (25marks).

Q5. The following table contains information concerning four jobs that are awaiting processing at a work center.

Job	*Job Time (days)*	*Due Date* (days)
A	14	20
B	10	16
C	7	15
D	6	17

(a). Sequence the jobs using (1) FCFS, (2) SPT, (3) EDD , and (4) CR. (18marks).
Note: *FCFS is first come first serve; SPT is shortest processing time, EDD is earliest due date, and CR means critical ratio.*

(b). For each methods in part *a*, determine (1) the average job flow time (2) the average tardiness, and (3) the average number of jobs at the work center. (5marks).

(c). Is one method superior to the others? Give the reason. (2marks).

Q6. ABC Motor Company produces small motor parts at a processing cost of E30 per unit. Defective motor parts can be reworked at a cost of E12 each. The company produces 100 motor parts per day and averages 80% good – quality motor parts, resulting in 20% defects, 50% of which can be reworked prior to shipping to spare parts dealers. You are required to assist the company compute the ***Quality –Productivity Ratio (QPR)*** and to examine the effects of:

(i). increasing the production rate to 200 motor parts per day (6marks).

(ii). reducing the processing costs by 13.33% and the rework cost by 16.67%. (6marks).

(iii). increasing through quality improvement the product yield of good quality products to 95%. (6marks).

(iv). the combination of (ii) and (iii). (7marks).

TABLE 18.4
Infinite-source values for L_q and P_0 given λ/μ and M

λ/μ	M	L_q	P_0	λ/μ	M	L_q	P_0	λ/μ	M	L_q	P_0
0.15	1	0.026	.850	1.1	2	0.477	.290	2.4	3	2.589	.056
	2	0.001	.860		3	0.066	.327		4	0.431	.083
0.20	1	0.050	.800		4	0.011	.332		5	0.105	.089
	2	0.002	.818	1.2	2	0.675	.250		6	0.027	.090
0.25	1	0.083	.750		3	0.094	.294		7	0.007	.091
	2	0.004	.778		4	0.016	.300	2.5	3	3.511	.045
0.30	1	0.129	.700		5	0.003	.301		4	0.533	.074
	2	0.007	.739	1.3	2	0.951	.212		5	0.130	.080
0.35	1	0.188	.650		3	0.130	.264		6	0.034	.082
	2	0.011	.702		4	0.023	.271		7	0.009	.082
0.40	1	0.267	.600		5	0.004	.272	2.6	3	4.933	.035
	2	0.017	.667	1.4	2	1.345	.176		4	0.658	.065
0.45	1	0.368	.550		3	0.177	.236		5	0.161	.072
	2	0.024	.633		4	0.032	.245		6	0.043	.074
	3	0.002	.637		5	0.006	.246		7	0.011	.074
0.50	1	0.500	.500	1.5	2	1.929	.143	2.7	3	7.354	.025
	2	0.033	.600		3	0.237	.211		4	0.811	.057
	3	0.003	.606		4	0.045	.221		5	0.198	.065
0.55	1	0.672	.450		5	0.009	.223		6	0.053	.067
	2	0.045	.569	1.6	2	2.844	.111		7	0.014	.067
	3	0.004	.576		3	0.313	.187	2.8	3	12.273	.016
0.60	1	0.900	.400		4	0.060	.199		4	1.000	.050
	2	0.059	.538		5	0.012	.201		5	0.241	.058
	3	0.006	.548	1.7	2	4.426	.081		6	0.066	.060
0.65	1	1.207	.350		3	0.409	.166		7	0.018	.061
	2	0.077	.509		4	0.080	.180	2.9	3	27.193	.008
	3	0.008	.521		5	0.017	.182		4	1.234	.044
0.70	1	1.633	.300	1.8	2	7.674	.053		5	0.293	.052
	2	0.098	.481		3	0.532	.146		6	0.081	.054
	3	0.011	.495		4	0.105	.162		7	0.023	.055
0.75	1	2.250	.250		5	0.023	.165	3.0	4	1.528	.038
	2	0.123	.455	1.9	2	17.587	.026		5	0.354	.047
	3	0.015	.471		3	0.688	.128		6	0.099	.049
0.80	1	3.200	.200		4	0.136	.145		7	0.028	.050
	2	0.152	.429		5	0.030	.149		8	0.008	.050
	3	0.019	.447		6	0.007	.149	3.1	4	1.902	.032
0.85	1	4.817	.150	2.0	3	0.889	.111		5	0.427	.042
	2	0.187	.404		4	0.174	.130		6	0.120	.044
	3	0.024	.425		5	0.040	.134		7	0.035	.045
	4	0.003	.427		6	0.009	.135		8	0.010	.045
0.90	1	8.100	.100	2.1	3	1.149	.096	3.2	4	2.386	.027
	2	0.229	.379		4	0.220	.117		5	0.513	.037
	3	0.030	.403		5	0.052	.121		6	0.145	.040
	4	0.004	.406		6	0.012	.122		7	0.043	.040
0.95	1	18.050	.050	2.2	3	1.491	.081		8	0.012	.041
	2	0.277	.356		4	0.277	.105	3.3	4	3.027	.023
	3	0.037	.383		5	0.066	.109		5	0.615	.033
	4	0.005	.386		6	0.016	.111		6	0.174	.036
1.0	2	0.333	.333	2.3	3	1.951	.068		7	0.052	.037
	3	0.045	.364		4	0.346	.093		8	0.015	.037
	4	0.007	.367		5	0.084	.099				
					6	0.021	.100				

(continued)

8.4

λ/μ	M	L_q	P_0	λ/μ	M	L_q	P_0	λ/μ	M	L_q	P_0
3.4	4	3.906	.019	4.3	7	0.289	.130	5.2	6	4.301	.003
	5	0.737	.029		8	0.097	.013		7	1.081	.005
	6	0.209	.032		9	0.033	.014		8	0.368	.005
	7	0.063	.033		10	0.011	.014		9	0.135	.005
	8	0.019	.033	4.4	5	5.268	.006		10	0.049	.005
3.5	4	5.165	.015		6	1.078	.010		11	0.018	.006
	5	0.882	.026		7	0.337	.012	5.3	6	5.303	.003
	6	0.248	.029		8	0.114	.012		7	1.249	.004
	7	0.076	.030		9	0.039	.012		8	0.422	.005
	8	0.023	.030		10	0.013	.012		9	0.155	.005
	9	0.007	.030	4.5	5	6.862	.005		10	0.057	.005
3.6	4	7.090	.011		6	1.265	.009		11	0.021	.005
	5	1.055	.023		7	0.391	.010		12	0.007	.005
	6	0.295	.026		8	0.134	.011	5.4	6	6.661	.002
	7	0.019	.027		9	0.046	.011		7	1.444	.004
	8	0.028	.027		10	0.015	.011		8	0.483	.004
	9	0.008	.027	4.6	5	9.289	.004		9	0.178	.004
3.7	4	10.347	.008		6	1.487	.008		10	0.066	.004
	5	1.265	.020		7	0.453	.009		11	0.024	.005
	6	0.349	.023		8	0.156	.010		12	0.009	.005
	7	0.109	.024		9	0.054	.010	5.5	6	8.590	.002
	8	0.034	.025		10	0.018	.010		7	1.674	.003
	9	0.010	.025	4.7	5	13.382	.003		8	0.553	.004
3.8	4	16.937	.005		6	1.752	.007		9	0.204	.004
	5	1.519	.017		7	0.525	.008		10	0.077	.004
	6	0.412	.021		8	0.181	.009		11	0.028	.004
	7	0.129	.022		9	0.064	.009		12	0.010	.004
	8	0.041	.022		10	0.022	.009	5.6	6	11.519	.001
	9	0.013	.022	4.8	5	21.641	.002		7	1.944	.003
3.9	4	36.859	.002		6	2.071	.006		8	0.631	.003
	5	1.830	.015		7	0.607	.008		9	0.233	.004
	6	0.485	.019		8	0.209	.008		10	0.088	.004
	7	0.153	.020		9	0.074	.008		11	0.033	.004
	8	0.050	.020		10	0.026	.008		12	0.012	.004
	9	0.016	.020	4.9	5	46.566	.001	5.7	6	16.446	.001
4.0	5	2.216	.013		6	2.459	.005		7	2.264	.002
	6	0.570	.017		7	0.702	.007		8	0.721	.003
	7	0.180	.018		8	0.242	.007		9	0.266	.003
	8	0.059	.018		9	0.087	.007		10	0.102	.003
	9	0.019	.018		10	0.031	.007		11	0.038	.003
4.1	5	2.703	.011		11	0.011	.007		12	0.014	.003
	6	0.668	.015	5.0	6	2.938	.005	5.8	6	26.373	.001
	7	0.212	.016		7	0.810	.006		7	2.648	.002
	8	0.070	.016		8	0.279	.006		8	0.823	.003
	9	0.023	.017		9	0.101	.007		9	0.303	.003
4.2	5	3.327	.009		10	0.036	.007		10	0.116	.003
	6	0.784	.013		11	0.013	.007		11	0.044	.003
	7	0.248	.014	5.1	6	3.536	.004		12	0.017	.003
	8	0.083	.015		7	0.936	.005	5.9	6	56.300	.000
	9	0.027	.015		8	0.321	.006		7	3.113	.002
	10	0.009	.015		9	0.117	.006		8	0.939	.002
4.3	5	4.149	.008		10	0.042	.006		9	0.345	.003
	6	0.919	.012		11	0.015	.006		10	0.133	.003