

UNIVERSITI SAINS MALAYSIA

Second Semester Final Examination
Academic Session 1995/96

April 1996

AGW517 - OPERATIONS MANAGEMENT

Time : [3 hours]

INSTRUCTION

Please make sure that this examination paper consists of **EIGHT (8)** printed pages before you begin.

There are **EIGHT (8)** questions here. All questions in Section A are **COMPULSORY**. In addition, answer any **THREE (3)** from Section B.

SECTION A : Answer **ALL** the questions.

1. Answer any **TWO** from the following:

- a. Discuss the relevance of *chase* strategy and *level* strategy in the production planning environment. If you are a production planner, which strategy would you adopt? Give reasons.
- b. Discuss the usefulness of product-oriented and process-oriented layout strategies by giving suitable examples. If you are a General Manager of a Supermarket, what are the factors that will help you to develop appropriate layout?
- c. What are the different types of inventory? What are the roles of each one of them in a production system? Discuss an appropriate method of selective control for inventory.
- d. Discuss the importance of quality in a production environment. Discuss the method that could be used to screen the quality of incoming material. What are *producer's risk* and *consumer's risk* and briefly mention their importance.

[20 marks]

...2/-

2. **Problem of Malaysian Sound Systems:** Malaysian Sound Systems (MSS) manufactures and sells stereo sound systems in both console and component styles. All parts of the sound systems, with the exception of turntables, are produced in its Prai plant. Turntables used in the assembly of MSS's systems are purchased from Roxy Electronics of Johor Baru.

Ms Cathy, the purchasing officer for MSS, submits a purchase requisition for the multispeed turntables once every four weeks. The company's annual requirements total 5,000 units (20 per working day), and the cost per unit is RM60. (MSS does not purchase in greater quantities because Roxy Electronics, the supplier, does not offer quantity discounts). Rarely does a shortage of turntables occur because Roxy delivery is within one week following receipt of a purchase requisition. (Total time between date of order and date of receipt is 10 days).

Associated with purchase of each shipment are procurement costs. These costs, which amount to RM20 per order, include the costs of preparing the requisition, inspecting and storing the delivered goods, updating inventory records, and issuing a voucher and a check for payment. In addition to procurement costs, MSS incurs inventory carrying costs that include insurance, storage, handling, taxes, and so forth. These costs equal RM6 per unit per year.

Beginning in May of this year, management of MSS will embark on a company-wide cost control program in an attempt to improve its profits. One of the areas to be closely scrutinized for possible cost savings is inventory procurement.

Questions:

1. Compute the optimal order quantity.
2. Determine the appropriate reorder point (in units).
3. Compute the cost savings that the company will realize if it implements the optimal inventory procurement decision.
4. What are your alternative suggestions for cost savings concerning the above inventory problem.

[20 marks]

...3/-

3. A small manufacturing unit produces two products Alpha and Beta using two machines. Production of Beta results in a by-product Gama and a certain amount of this by-product (Gama) can be sold at a profit of RM20 per unit, but beyond this quantity (due to lack of demand) the excess production of Gama must be destroyed at a cost of RM5 per unit. Every unit of Alpha contributes RM30 in profit while Beta yields a profit of RM80 per unit. There is unlimited demand for Alpha and Beta.

Past experience indicates five units of Gama can be sold daily at a profit and anything beyond five has to be destroyed. The firm produces three units of Gama for every unit of Beta produced and there is unlimited demand for both the products Alpha and Beta. Every unit of product Alpha requires 3 hours each of processing time on the first and the second machines while for Beta it is 4 hours and 5 hours on the first and the second machines respectively. As the by-product results from producing Beta, no separate time is used in producing Gama. The total available times in a day are 18 hours and 21 hours on the first and the second machines respectively.

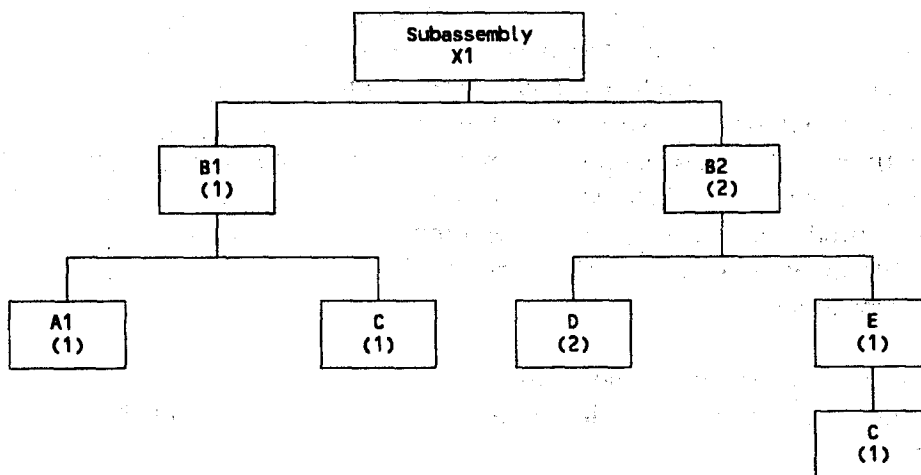
Identify decision variables and formulate the above problem as a linear programming problem and write its initial simplex tableau. Establish the dual and indicate its importance.

[15 marks]

...4/-

SECTION B : Answer any THREE questions.

4. The product structure for a subassembly is shown below. The master production schedule and the inventory status are also given. Develop (i) a gross requirements plan for all items, and (ii) net materials requirements (planned order release) for all items.



Master Production Schedule for X1

Period (week)	7	8	9	10	11	12
Gross requirements		50		20		100

Inventory status and lead times

Item	Leadtime (weeks)	Inventory On-hand	Item	Leadtime (weeks)	Inventory On-hand
X1	1	50	C	3	10
B1	2	20	D	1	0
B2	2	20	E	1	0
A1	1	5			

[15 marks]

...5/-

5. M & R Manufacturing Sdn Bhd produces custom-built pollution control devices for small and medium industries (SMIs). The most recent project undertaken by M & R requires 14 different activities. M & R management would like you to determine the total project completion time and the activities which require critical attention. What is the probability that the project would be completed in 48 days?

Activity	Immediate Predecessors	Activity Time (in days)		
		Optimistic	Most likely	Pessimistic
A	-	4	6	8
B	-	1	2	3
C	A	6	6	6
D	A	5	8	11
E	B,C	2	9	16
F	D	2	3	6
G	D	1	7	8
H	E,F	2	4	6
I	G,H	1	6	11
J	I	2	5	8
K	I	7	9	11
L	J	2	4	6
M	K	1	2	3
N	L,M	6	8	10

[15 marks]

6. A.King, the Chief Executive of King Electronics, has two design options for a new line of high-resolution cathode ray tubes (CRTs) for computer-aided design workstations. The product life-cycle sales forecast for the CRT is 100,000 units.

Design option A has a 0.90 probability of yielding 59 good CRTs per 100 and 0.10 probability of yielding 64 good CRTs per 100. This design will cost RM1,000,000.

Design option B has a 0.80 probability of yielding 64 good CRTs per 100 and 0.20 probability of yielding 59 good units per 100. This design will cost King Electronics RM1,350,000.

...6/-

Good or bad, each CRT will cost RM75, and each good CRT will be sold for RM150. Bad CRTs will be destroyed and have no salvage value. However, King has the option of improving the yield from 59 good CRTs per 100 units to 64 CRTs by adding an expensive procedure in the manufacturing of CRTs at an added cost of RM50 per CRT. This procedure will be good for only 5 units per 100, i.e., this procedure can bring the yield up to only 64 per 100 from 59 CRTs.

Develop a decision tree and using EMV analysis, suggest an appropriate alternative for King Electronics.

[15 marks]

7. Rescue Services Training (RST) trains emergency rescue squads for state, country and municipal council police and fire departments. The training programme development and improvement group at RST evaluates company training effectiveness, in part, by performance of trainee teams on the Simulated Emergency Rescue Exercise (SERE). During the SERE, trainee teams may err by omitting required steps as well as by committing acts that they shouldn't. The training group records total errors for each team. The table below shows the error data for the last twenty five trainee teams:

SERE Team	Errors	SERE Team	Errors	SERE Team	Errors	SERE Team	Errors	SERE Team	Errors
1	4	6	1	11	3	16	3	21	3
2	3	7	4	12	7	17	6	22	2
3	11	8	3	13	4	18	4	23	4
4	2	9	2	14	1	19	4	24	1
5	6	10	4	15	8	20	12	25	3

- (i) Plot the error data on an appropriate control chart.
- (ii) Analyze the chart and comment on process stability.

[15 marks]

8. a. Discuss the importance of forecasting in production management. Suggest two methods of forecasting for developing short-term and medium-term forecasts.

...7/-

- b. Micro-Computer Enterprises (MCE) are in the business of selling PCs for the local market. The manager of the MCE is interested in arriving at a sales forecast for computers so that adequate stocks can be ordered well ahead of demand. Data for the last ten weeks sales are as follows.

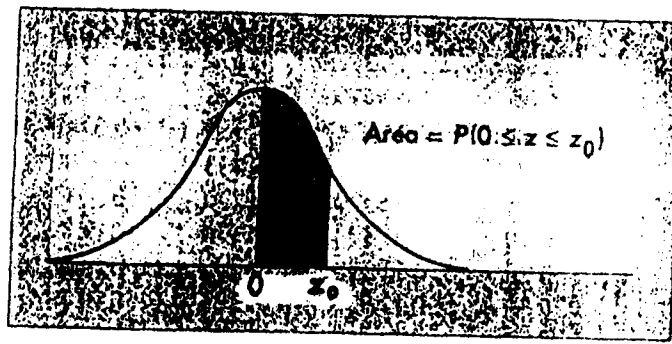
Week	Sales of Computers	Week	Sales of Computers
1	12	6	15
2	16	7	18
3	14	8	20
4	10	9	16
5	13	10	17

Prepare a forecast for week 11 using three week moving averages method and exponential smoothing method, with $\alpha=0.2$. Which forecast would you recommend to the manager?

[15 marks]

- oooOOOooo -

Normal curve areas



z_0	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
0.0	.0000	.0040	.0080	.0120	.0160	.0199	.0239	.0279	.0319	.0359
0.1	.0398	.0438	.0478	.0517	.0557	.0596	.0636	.0675	.0714	.0753
0.2	.0793	.0832	.0871	.0910	.0948	.0987	.1026	.1064	.1103	.1141
0.3	.1179	.1217	.1255	.1293	.1331	.1368	.1406	.1443	.1480	.1517
0.4	.1554	.1591	.1628	.1664	.1700	.1736	.1772	.1808	.1844	.1879
0.5	.1915	.1950	.1985	.2019	.2054	.2088	.2123	.2157	.2190	.2224
0.6	.2257	.2291	.2324	.2357	.2389	.2422	.2454	.2486	.2517	.2549
0.7	.2580	.2611	.2642	.2673	.2704	.2734	.2764	.2794	.2823	.2852
0.8	.2881	.2910	.2939	.2967	.2995	.3023	.3051	.3078	.3106	.3133
0.9	.3159	.3186	.3212	.3238	.3264	.3289	.3315	.3340	.3365	.3389
1.0	.3413	.3438	.3461	.3485	.3508	.3531	.3554	.3577	.3599	.3621
1.1	.3643	.3665	.3686	.3708	.3729	.3749	.3770	.3790	.3810	.3830
1.2	.3849	.3869	.3888	.3907	.3925	.3944	.3962	.3980	.3997	.4015
1.3	.4032	.4049	.4066	.4082	.4099	.4115	.4131	.4147	.4162	.4177
1.4	.4192	.4207	.4222	.4236	.4251	.4265	.4279	.4292	.4306	.4319
1.5	.4332	.4345	.4357	.4370	.4382	.4394	.4406	.4418	.4429	.4441
1.6	.4452	.4463	.4474	.4484	.4495	.4505	.4515	.4525	.4535	.4545
1.7	.4554	.4564	.4573	.4582	.4591	.4599	.4608	.4616	.4625	.4633
1.8	.4641	.4649	.4656	.4664	.4671	.4678	.4686	.4693	.4699	.4706
1.9	.4713	.4719	.4726	.4732	.4738	.4744	.4750	.4756	.4761	.4767
2.0	.4772	.4778	.4783	.4788	.4793	.4798	.4803	.4808	.4812	.4817
2.1	.4821	.4826	.4830	.4834	.4838	.4842	.4846	.4850	.4854	.4857
2.2	.4861	.4864	.4868	.4871	.4875	.4878	.4881	.4884	.4887	.4890
2.3	.4893	.4896	.4898	.4901	.4904	.4906	.4909	.4911	.4913	.4916
2.4	.4918	.4920	.4922	.4925	.4927	.4929	.4931	.4932	.4934	.4936
2.5	.4938	.4940	.4941	.4943	.4945	.4946	.4948	.4949	.4951	.4952
2.6	.4953	.4955	.4956	.4957	.4959	.4960	.4961	.4962	.4963	.4964
2.7	.4965	.4966	.4967	.4968	.4969	.4970	.4971	.4972	.4973	.4974
2.8	.4974	.4975	.4976	.4977	.4977	.4978	.4979	.4979	.4980	.4981
2.9	.4981	.4982	.4982	.4983	.4984	.4984	.4985	.4985	.4986	.4986
3.0	.4987	.4987	.4987	.4988	.4988	.4989	.4989	.4989	.4990	.4990

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