UNIVERSITI SAINS MALAYSIA

Second Semester Examination
Academic Session 1994/95

April 1995

AGW517 - OPERATIONS MANAGEMENT

Time : [3 hours]

INSTRUCTION :
Please ensure that this examination consists of **NINE (9)** printed pages before you begin.

Section A : Answer **BOTH** the questions.
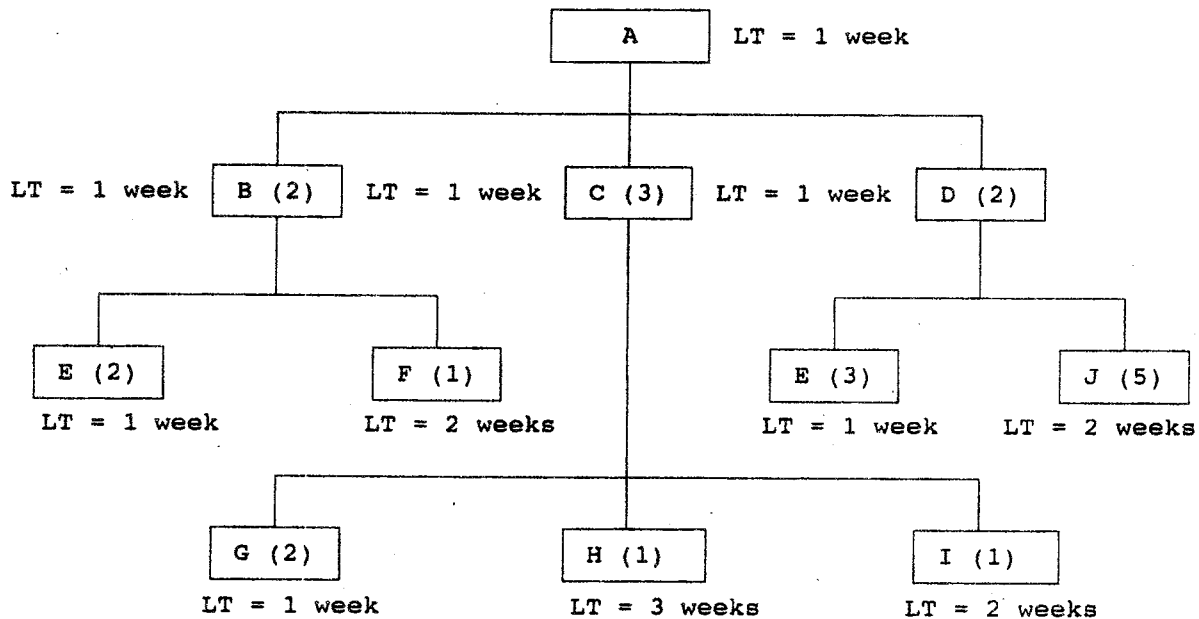Section B : Answer any **THREE (3)** questions.
Section C : Answer any **TWO (2)** questions.

Section A : Answer BOTH the questions.

1.a. What is the purpose of aggregate planning? Describe some demand and capacity options for implementing plans.

[7 marks]

b. Given the following bill-of-material, develop a gross requirement plan and planned order release for all items. In week 7, 100 units and in week 8, 150 units of item A are required and there are no on-hand inventory of any component [LT = lead time].

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                        ┌─────────┐
                        │    A    │  LT = 1 week
                        └─────────┘
        ┌───────────────────┼───────────────────┐
   ┌─────────┐         ┌─────────┐         ┌─────────┐
LT=1 week│ B (2) │ LT=1 week│ C (3) │ LT=1 week│ D (2) │
   └─────────┘         └─────────┘         └─────────┘
     ┌─────┴─────┐        │        ┌─────┴─────┐
┌─────────┐ ┌─────────┐   │   ┌─────────┐ ┌─────────┐
│  E (2)  │ │  F (1)  │   │   │  E (3)  │ │  J (5)  │
└─────────┘ └─────────┘   │   └─────────┘ └─────────┘
LT = 1 week LT = 2 weeks  │   LT = 1 week  LT = 2 weeks
                ┌─────────┼─────────┐
           ┌─────────┐ ┌─────────┐ ┌─────────┐
           │  G (2)  │ │  H (1)  │ │  I (1)  │
           └─────────┘ └─────────┘ └─────────┘
           LT = 1 week  LT = 3 weeks  LT = 2 weeks
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[13 marks]
...2/-

2.a. What are the main reasons for an organisation to have inventory? Describe the various costs associated with inventory management.

[8 marks]

b. Micro Ram is a sole distributor for APE personal computers (PC) in Northern Malaysia and past experience indicates that the average sales are steady at 400 units per month. The holding cost of a PC is RM350 per year (or 10 per cent of the price of a PC), while the ordering cost is RM715 per order and these computers are priced at RM3500 but the manufacturer has offered some discount depending on the order size, and, therefore, the new price structure is as follows :

Quantity Purchased	Unit Price
up to 99 units	RM 3500 (current price)
100 to 199 units	RM 3350
200 and above	RM 3250

What is your suggestion to Micro Ram on the order size? Determine the associated cost of annual inventory.

[13 marks]

SECTION B : Answer any THREE (3) questions.

3. A small manufacturing unit produces two products A and B using two operations. Production of item B results also in a by-product C and a certain amount of this by-product can be sold at a profit of RM2 per unit, but beyond this quantity, the excess production (of the by-product) must be destroyed at a cost of RM1, because of inadequate demand. Every unit of product A contributes RM3 in profit while the product B yields a profit of RM8 per unit.

Past experience indicates that up to 5 units of C can be sold in a day at a profit and anything beyond 5 has to be destroyed. The firm produces 3 units of C for

...3/-

every unit of B produced and there is unlimited demand for both the products A and B. Every unit of product A requires 3 hours each of processing time on the first and the second operations while for B it is 4 hours and 5 hours on the first and the second operations respectively. As the by-product results from producing B, no separate time is used in producing C. The total available times in a day are 18 hours and 21 hours on the first and the second operations respectively.

Identify decision variables and formulate the above problem as a linear programming problem and write down the initial simplex tableau for the same.

[13 marks]

4. The City Auto Mart is planning to introduce a new car that features a radically new pollution-control system. It has two alternatives : the first is to build a new plant with full production coming in three years' time. The second is to build a small pilot plant for limited production for the coming year. If the results of the pilot plant show encouraging results at the end of the first year, full-scale production in a newly constructed plant would still be possible in three years' from now. If they decide to go with the pilot plant, and subsequently it results into an unattractive proposition to go into full production, the pilot plant can still be operated by itself at a small profit. The expected annual profits for various alternatives are given below :

Production facilities	Consumer acceptance	Annual profit (in RM millions)
New Plant	high	14
New Plant	low	-6
Pilot Plant	high	2
Pilot Plant	low	1

City Mart's marketing research division has estimated that there is 50 : 50 per cent chance that the consumer acceptance is high or low. If the pilot plant is put into production, with a low keyed advertising programme, the department feels that the probabilities are 45% for high consumer acceptance and 55% for low acceptance.

...4/-

Further, they have estimated that if the pilot plant is built and the consumer acceptance is found to be high, there is a 90 per cent probability of high acceptance with full production. If the consumer acceptance with the pilot plant is found to be low, however, there is only a 10 per cent probability of high eventual acceptance with full production. What are your suggestions to the City Mart? (Use decision tree approach).

[13 marks]

5.a. The monthly sales of room air conditioners by Acme Manufacturing Bhd. during 1994/95 have been as follows :

Month	No. of Units	Month	No. of Units
August	100	December	105
September	80	January	110
October	110	February	125
November	115	March	120

Use the exponential smoothing method (with $\alpha = 0.2$) and forecast the sales for April, 1995. Make suggestions for improving the forecast.

[7 marks]

b. A small printing firm is about to complete its lease, and so it must decide to move to another location. Two sites are currently under consideration. Site A would have a fixed costs of RM8,000 per month, and site B would have a fixed costs of RM9,400 per month. Variable costs are expected to be RM5 per unit at site A and RM4 per unit at site B. Monthly demand has been steady at 8,800 units for last several years and is not expected to change even with the new location. The units are sold at RM6 per unit. Which location is the best for the firm?

[6 marks]

...5/-

6. Schware Chemicals Sdn. Bhd., a chemical manufacturers in Bayan Baru, Penang, has long been trying to avoid the installation of an expensive air pollution control equipment. The local government finally has given Schware 5 months (equivalently 22 weeks) to install a complex air-filter system on its main smokestack. Schware has been further warned that the chemical plant will compulsorily be closed unless the above air-pollution device is installed in the allotted period of time. The General Manager of Schware wanted to ensure that the installation of the air filtering system is installed smoothly within the given time, and therefore, collected the following details.

Activity	Details	Immediate predecessor	Activity times(weeks)		
			a	m	b
A	Build internal components	-	2	3	4
B	Modify roof and floor	-	3	4	5
C	Construct collection stack	A	2	3	4
D	Pour concrete and install frame	B	3	5	7
E	Build high temperature burner	C	2	5	8
F	Install control system	C	2	3	10
G	Install air pollution device	D, E	4	5	12
H	Inspection and testing	F, G	2	3	4

Using PERT analysis, determine when earliest the air-filtering system can be installed. What is the probability of completing the project within the allotted time of 22 weeks?

[13 marks]

7.   During the recent past Telecom Bhd. has been receiving several complaints from the customers on the wrong billings. In order to verify these complaints, the Financial Controller of Telecom selected daily samples of 100 bills and inspected for defective (wrong) billing. Over the past 21 days, the following information have been gathered. Develop an appropriate control chart and determine whether the process is in control. What are your suggestions?

Day	Number of Defective Bills	Day	Number of Defective Bills	Day	Number of Defective Bills
1	6	8	3	15	4
2	5	9	6	16	5
3	6	10	3	17	6
4	4	11	7	18	5
5	3	12	5	19	4
6	4	13	4	20	3
7	5	14	3	21	7

[13 marks]

SECTION C : Answer any TWO (2) questions.

8.   What are the similarities and differences in service facility location and industrial location decisions? If you are a Regional Manager of a leading bank, what considerations would you attach in the selection of location for a bank branch?

[10 marks]

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9.   What are the different phases of the product life cycle?   What are the major considerations that go-in for make or buy decisions?   You may illustrate by giving some examples.

[10 marks]

10.   What are the different layout strategies used in production management?   What layout variables you might want to consider particularly important in an office layout and a retail-outlet layout?

[10 marks]

11.   What is a queuing problem?   What are the components in a queuing system? Describe the important operating characteristics of a queuing system.

[10 marks]

- oooOOOooo -

Normal curve areas

Area $= P(0 \le z \le z_0)$
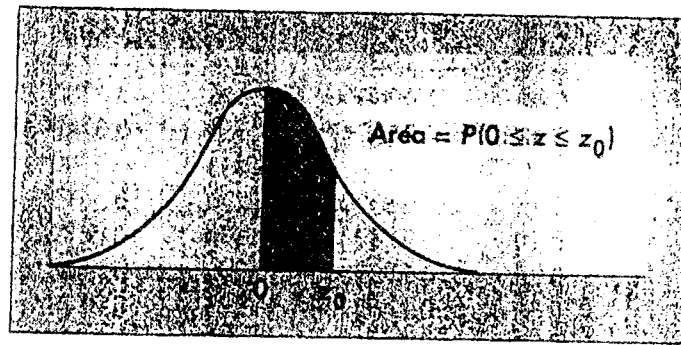
z_0	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
0.0	.0000	.0040	.0080	.0120	.0160	.0199	.0239	.0279	.0319	.0359
0.1	.0398	.0438	.0478	.0517	.0557	.0596	.0636	.0675	.0714	.0753
0.2	.0793	.0832	.0871	.0910	.0948	.0987	.1026	.1064	.1103	.1141
0.3	.1179	.1217	.1255	.1293	.1331	.1368	.1406	.1443	.1480	.1517
0.4	.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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