Uva Wellassa University
Faculty of Management
Bachelor of Business Management in Entrepreneurship and Management
Year 1 Semester II Examination June/ July 2010

EMG 273-3, Scientific Decision Making

Index No.

Time: Two Hrs and thirty minutes

Part C-Essay Questions

Answer All Questions
Total marks allocation: 50 Marks

01.

A Piano manufacturer manufactures two types of pianos A & B. The products are manufactured through three processes. The time required by the product on each process, the time available for each process and the profit per unit of the two products are given below:

Piano types	Processing time (hr)			Profit per unit
	X	Y	Y	
A	2	5	5	5
B	4	2	2	8
Time available	24	18	36	

(a) State the objective function and constraints algebraically

(3 Marks)

(b) Solve this problem using the simplex method

(10 marks)

(c) What is the optimal product mix for maximum profit?

(3Marks)

(Total 16 Marks)

02. A sociologist plans a questionnaire survey consisting of the following tasks

Activity	Predecessor	T_m	T_o	T_p
A. Design of Questionnaire	-	5	4	6
B. Sampling Design	-	12	8	16
C. Testing of Questionnaire	A	5	4	12
D. Recruiting for interviewers	B	3	1	5
E. Training of interviewers	D,A	2	2	2
F. Allocation of areas to interviewers	B	5	4	6
G. Conducting interviewers	C,E,F	14	10	18
H. Evaluating of results	G	20	18	34

a) What are the expected task durations and the variances of task duration?

(3 marks)

b) Draw a network for the project and find the critical path.

(8 marks)

c) What is the expected duration of the project?

(3 marks)

d) What is the probability that project will not exceed 60 days?

(3 marks)

(Total 17 marks)

03. Confectioner has three bakeries X, Y & Z. a new type of cream cake is being introduced The cake will be sold through 4 retails outlets – A, B, C and D. the success of the launc depends on the cake being available at the 4 outlets simultaneously and has fresh a possible. The time required in hours to transport the cakes from bakeries to retails outlets the demand of each outlets and the availability at each factory are given in the table below

TO / from	A	B	C	D	Availability
X	5	6	4	8	35
Y	6	5	4	6	25
Z	8	4	8	7	30
Demand	25	20	25	20	

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01.

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(3 Marks)

(b) Solve this problem using the simplex method

(10 marks)

(c) What is the optimal product mix for maximum profit?

(3Marks)

(Total 16 Marks)

02

(a) Prepare a transportation table for this problem. (03 Marks)

(b) Determine the initial basic feasible solution by Vogel's Approximation Method (VAM) (06 Marks)

(c) Calculate the optimal solution to minimize transportation cost by MODI Method. (08 Marks)

(Total 17 Marks)

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Part C

Answer Three (3) Questions only

01. A small-scale industrialist in Colombo produces four types of machine components A, B, C and made of brass. The amount of steel and brass required for each component and the number of the man weeks, of labour required to manufacture and assemble one unit of each component are as follows:

	A	B	C	D	Availability
Steel	6	5	3	2	100 kg
Brass	3	4	9	2	75 kg
Labour	1	2	1	2	20 man weeks

Note: The profit on the each unit of A, B, C and D is Rs 60, 40, 70 and 50 respectively

(a) State the objective function and constraints algebraically (05 Marks)

(b) Solve this problem using the simplex method (15 Marks)

(Total 20 Marks)

02. A Team of chemists is planning to undertake an applied research project to test a formula for a new synthetic material. The project can be separated into 12 distinct activities. The relationship amongst the activities and the time estimates in days are given below.

Activity	Immediate Predecessors	Activity time estimates(days)		
		Optimistic (a)	Most Probable (m)	Pessimistic (b)
A	-	12	15	36
B	-	3	4.5	15
C	A	6	9	12
D	A	9	12	33
E	A	4	10	16
F	C	3	8	13
G	D	5	12	19
H	B,E	3	7	17
I	H	4	8	12
J	F,G,I	6	10.5	18
K	H	5	8	17
L	J,k	4	7	16

02

a) Find expected time for each activity.

(4 Marks)

b) Construct the network diagram for above data.

(8 Marks)

c) What are the critical path activities and project completion time?

(4 marks)

d) Find the probability of completion the project before 60 days.

(4 marks)

$$\text{Expected/ mean time} = \frac{O + 4M + P}{6}$$

$$\text{Standard Deviation} = \frac{P + O}{6}$$

$$Z = \frac{x - \mu}{\sigma}$$

03. A. Singer Company produces electric fans at three factories. Monthly supplies and factories are,

	Number of units
Colombo (C)	400
Kandy (K)	320
Matara (M)	180

Demand in the distribution centers of Badulla, Jaffna and Ampara are,

	Demand per weeks (unit)
Badulla	360
Jaffna	240
Ampara	300

Unit transportation costs (in Rupees) are shown in below

	Badulla	Jaffna	Ampara
Colombo	32	40	24
Kandy	28	16	36
Matara	52	48	32

(a) Prepare a transportation table for this problem.

(05 Marks)

(b) Determine the intial basic feasible solution by Vogel's Approximation Method (VAM)

(06 Marks)

(c) Calculate the optimal solution to minimize transportation cost by MODI Method.

(09 Marks)

(Total 20 Marks)

04. A)

A factory follows an economic order quantity system for maintaining stocks of one of its component requirements. The annual demand is 24000 units, the cost of placing an order is Rs 300, and the component cost is Rs 60 per unit. The factory has imputed 24% as inventory carrying rate.

(a) Find the optimal interval for placing an order, assuming a year is equivalent to 360 days. (05 Marks)

(b) If it is decided to place only one order per month, how much extra cost does the factory incur per year as a consequence of this decision?

(05 Marks)

B)

A company has four districts. North, South, East and West to sell its production and four salesmen A,B,C and D for it. The district wise cost of allocation of each salesman is given below.

Employees / Jobs	A	B	C	D
1	420	350	280	210
2	300	250	200	150
3	300	250	200	150
4	240	200	160	120

Determine the area allocation so that the allocation cost is minimized.

(10 Marks)

(Total 20 Marks)