Uva Wellassa University
Faculty of Management
Degree of Bachelor of Business Management in Entrepreneurship and Management
THIRD YEAR SECOND SEMESTER EXAMINATION – SEPTEMBER /OCTOBER 2012
EMG 374 -3 Scientific Decision Making

Instructions to candidates:
No. of pages : Six (06)
No. of questions : Three (03) Essay
Time allocation : One (01) Hour and Thirty (30) Minutes
Marks allocated : 50 Marks
Answer **only two (02)** questions
Question paper is not to be removed from the examination hall.

Index Number:

Part C –Essay Questions

01)

a. Green Veg Private Limited has a 100 acre farm. The company can sell all Tomatoes, Radishes or Lettuce and can raise the price to obtain Rs.100.00, Rs.75.00 and Rs.120 per Kg of Tomatoes, Radishes and Lettuce, respectively. The average yield per acre is 2000 kg of Tomatoes, 2000 kg of Lettuce and 3000 kg of Radishes. Fertilizers are available at Rs.500.00 per kg and the amount required per acre is 100 kgs each for Tomatoes, and Lettuce and 50kgs for Radishes. Labour requires for sawing, cultivating and harvesting per acre is 5 man-days for Tomatoes and Radishes and 8 man days for Lettuce. A total of 400 man-days of labour are available at Rs.1,000 per man-day.

You are required to;

i. Formulate this problem as a linear programming model to maximize the farmer's total profit.

(5 marks)

ii. Setup the initial simplex table

(3 marks)

21

b. You are given the following linear programming model.

Maximize $Z = 3X_1 + 4X_2$

Subject to;

$$\begin{aligned} 4X_1 + 2X_2 &\leq 100 \\ 4X_1 + 6X_2 &\leq 180 \\ X_1 + X_2 &\leq 40 \\ X_1 + 0X_2 &\geq 20 \\ 0X_1 + X_2 &\leq 10 \\ X_1 , X_2 &\geq 0 \end{aligned}$$

You are required to:

i. Solve the above LP model using graphical method

(4 marks)

ii. Demonstrate by using the above answer that "the optimal solution to a linear programming problem is feasible, but a feasible solution is not necessarily optimal".

(3 marks)

c. Multi products PLC has three (03) factories in Kandy, Colombo and Badulla. They distribute their products through three wholesalers in Mahiyanganaya, Matara and Vovuniya. The production capacities of the three factories are 1500, 850 and 650 metric tones respectively in Kandy, Colombo and Badulla. The demand of the three wholesalers, Mahiyanganaya, Matara and Vovuniya are 1350, 700 and 800 metric tones, respectively. The transportation costs (in Rupees) of one unit from different factories to different wholesalers are given below.

	Mahiyanganaya	Matara	Vovuniya
Colombo	45	40	60
Kandy	20	45	25
Badulla	10	20	80

You are required to find the initial basic solution to the above transportation problem using the Vogel's Approximation method.

(10 marks)

(Total 25 marks)

02)

a. A software development center is planning to develop five (5) application programs. There are five (05) expert programmers who could develop these programs. The Chief Executive Officer of the Software development center has collected information on computer time required (in minutes) by each programmer to develop each of the programs as shown by the following matrix.

		Program				
		S1	**S2**	**S3**	**S4**	**S5**
Experts	**P1**	170	150	130	250	150
	P2	180	156	132	264	156
	P3	150	132	114	228	138
	P4	160	144	120	240	144
	P5	152	128	112	224	136

You are required to find how these experts should be assigned to the programs so as to minimize the total computer time utilization.

(4 marks)

b. The marketing department of Smart Leather Products Enterprise has four (04) sales representatives to cover four (04) sales Districts. The Districts have different sales potentials and the sales representatives have different marketing capabilities. Considering the capabilities of the sales representatives and the nature of the demand of the different districts, the following estimates of monthly sales (in 1000 rupees) of each representative in each district have been provided to you.

		District			
		A	**B**	**C**	**D**
Sales Representative	**I**	260	265	195	157
	II	230	190	150	170
	III	230	180	140	160
	IV	190	86	150	187

The marketing manager of Smart Leather Products Enterprise is seeking your advice on assigning the sales representatives to the districts in order to maximize the monthly sales revenue.

You are required to advise the marketing manager providing the optimal assignment of sales representatives.

(6 marks)

c. Queen Beauty Cosmetics PLC has just received CDDRA (Cosmetics, Devices and Drug Regulatory Sri Lanka) approval to market a new fairness cream. All of the research for this fairness cream and the laboratory testing have been completed. In order to introduce the product, the company must yet deal with matters relating to production and marketing. Production and marketing managers have listed eleven (11) activities which must be performed before introducing the product to the market.

These eleven activities have been listed in the following table along with other information.

Activity	Immediate predecessor	Time (Weeks)	Estimated Direct cost
A (Quality Control System)	None	12	16,000.00
B (Raw material acquisition)	None	6	80,000.00
C (Production facility set up)	None	8	17,500.00
D (Compile cosmetic sales information)	None	5	8,500.00
E (Test Manufacture)	B,C	7	16,000.00
F (Full manufacture of a batch)	A,E	10	22,000.00
G (Prepare advertising program)	D	3	11,000.00
H (Update sales people)	D	9	21,000.00
I (Advertising contracts)	A,E,G	3	80,000.00
J (Initial Advertising)	I	8	25,000.00
K (Ship to pharmacies)	F	5	42'000.00

Estimated indirect cost per week is Rs.1,000.00

You are required to;

i. Draw the project network corresponding to normal time

(5 marks)

ii. Calculate earliest starting time, earliest finishing time, latest starting time and latest finishing time of each activity

(5 marks)

iii. Calculate the total float of each activity

(2 marks)

iv. Determine the critical path, normal duration and the cost of the project

(3 marks)

(Total-25 marks)

03)

a. Petro Mart service station operates a single petrol pump. Vehicles arrive according to a poison distribution at an average rate of 24 vehicle per hour. Vehicles can be serviced at the rate of 30 per hour on average. Note that the service time per vehicle follows an exponential probability distribution.

You are required to Calculate;

i. the proportion of time that the server is busy serving the customers.

(2 marks)

ii. the proportion of time that the system will be found idling

(2 marks)

iii. length of the system

(2 marks)

iv. length of the queue

(2 marks)

v. waiting time of the system

(2 marks)

vi. waiting time of the queue

(2 marks)

b. Uva Dairy products limited is considering expanding its business to produce a new dairy product. At the moment, the company has two courses of action open to it, to test market the product or abandon it. If the company does the test marketing, it will cost Rs.150,000 and the market response could be positive or negative with probabilities of 0.7 and 0.3, respectively. If the market response is positive the company could either abandon the product or produce it full scale.

If the company produces the new product in full scale, the outcome might be low, moderate or high demand and the respective net payoffs would be -200,000, 200,000 and 1,000,000 (in Rupees). The probability of having a high, moderate and low demand would be 0.2, 0.5 and 0.3, respectively.

If the market responses to test marketing negatively the company can either produce the product or abandon it. If the company goes ahead and produce the product with negative response the estimated loses would be Rs.50,000.

If at any point, the company abandons the product, there would be a net gain of Rs.65,000 from the sale of scrap. All the financial values have been discounted to the present.

You are required to;

i. Construct a decision tree diagram.

(6 marks)

ii. Include the figures of probabilities, cost and profit or loss on the appropriate branches in the tree

(5 marks)

iii. Clearly state the decision to the above problem that you wish to make

(2 marks)

(Total- 25 marks)

*** End of the paper***