Uva Wellassa University

Faculty of Management

Degree of Bachelor of Business Management in Entrepreneurship and Management

THIRD YEAR SECOND SEMESTER EXAMINATION –MAY/JULY 2017

EMG 374 -3 Scientific Decision Making

Instructions to candidates:

No. of pages : Six (06)
No. of questions : Six (06) Essay
Time allocation : Three (03) Hours
Marks allocated : 100 Marks
Answer **all** questions

Index Number:

01.

i) Binura Toy industries private limited produces three (03) types of toys T1, T2 and T3. The company use same raw material to produce three toys and it is required to use two (02) machines for production process and given below is the raw material usage and required processing time in minutes for each product in each machine and the total availability of raw material and machine time.

Resource	Product			Total availability per week
	T1	T2	T3	
Machine I (time in minutes)	1	2	3	2,000
Machine II (time in minutes)	2	1	2	2,500
Raw material (in Kgs)	3	2	1	1500

The contribution per unit of T1, T2 and T3 are Rs.30, Rs.20 and Rs.40 respectively. The company must manufacture 250 units of T1 and 200 units of T2 to cater to the established customers.

You are required to;

Formulate this production problem as a linear programming model to find out the optimum number of units to be produce from each product to maximize the profitability. (10 Marks)

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ii) You are given the following linear programming model.

Maximize $Z = 15X_1 + 20X_2$

Subject to;

$$2X_1 + X_2 \leq 200$$

$$2X_1 + 6X_2 \leq 300$$

$$X_1 + X_2 \leq 100$$

$$X_1 + 0X_2 \geq 20$$

$$X_1 , X_2 \geq 0$$

You are required to:

a. Solve the above LP model using graphical method (08 Marks)

b. Identify the binding constraints (02 Marks)

(Total Marks - 20)

02.

i) What is meant by a "Balanced Transportation Problem"? (03 Marks)

ii) A manufacturing company has three (03) factories; Factory 1 Factory 2 and Factory 3 in three districts. They distribute their products through three wholesalers in Kandy, Colombo and Kurunegala. The production capacities of the three factories are 7,500, 4,250 and 3,250 units respectively in Factory 1, Factory 2 and Factory 3. The demand of the three wholesalers, Kandy, Colombo and Kurunegala are 6,750, 3,500 and 4,750 units, respectively. The transportation costs (in Rupees) of one unit from each factory to each wholesaler are given below.

	Kandy	Colombo	Kurunegala	**Supply**
Factory 1	45	40	60	**7,500**
Factory 2	20	45	25	**4,250**
Factory 3	10	20	80	**3,250**
Demand	**6,750**	**3,500**	**4,750**	**15,000**

You are required to;

a. Find the initial basic solution to the above transportation problem (06 Marks)

b. Discuss whether the answer to part (a) above is providing the optimal solution to the given transportation problem. (07 Marks)

(Total Marks-16)

03.

i) 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. (08 Marks)

ii) 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. (08 Marks)

(Total Marks - 16)

04. Inventory control is one of the important aspects to be considered by any business organizations.

i) List the four (04) categories of costs associates with inventories (02 Marks)

ii) Briefly describe the factors to be considered in inventory analysis (04 Marks)

iii) A company required 50,000 units to cater its annual demand. The purchase price per unit is Rs.10 and the company spends Rs.150 for placing each order. The carrying cost is 15% of purchase price.

You are required to calculate;

a. the economic order quantity (04 Marks)

b. the optimal number of orders to be placed per annum (02 Marks)

c. the time between two consecutive orders (02 Marks)

d. total ordering and carrying cost (excluding purchase price) (02 Marks)

(Total Marks - 16)

05. A Pharmaceutical manufacturing company decided to produce and market a new medicine which they have recently got the approval from the relevant authorities. All of the researches for this medicine 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 twelve (12) activities which must be performed before introducing the product to the market.

These twelve (12) activities have been listed in the following table along with other information.

Activity	**Immediate predecessor**	**Time (Weeks)**
A	None	14
B	None	5
C	None	6
D	None	5
E	B,C	7
F	A,E	10
G	D	3
H	D	9
I	A,E	3
J	I,G	8
K	F	5
L	H	2

You are required to;

a. Draw the project network corresponding to normal time (06 Marks)

b. Calculate earliest starting time, earliest finishing time, latest starting time and latest finishing time of each activity (04 Marks)

c. Calculate the total float of each activity (02 Marks)

d. Determine the critical path, normal duration (04 Marks)

(Total Marks - 16)

06.

i) Briefly explain the three (03) commonly used criteria for decision making when probability information regarding the likelihood of the states of nature is unavailable.

(06 Marks)

ii) A government dispensary operates with a single medical Doctor. The patients arrive at the dispensary according to a poison distribution at an average rate of 24 patients per hour. The average service rate is 30 patients per hour. Note that the service time per patient follows an exponential probability distribution.

You are required to Calculate;

a. the proportion of time that the server is busy serving the customers. (02 Marks)

b. the proportion of time that the system will be found idling (02 Marks)

c. average number of patients in the system (02 Marks)

d. average number of patients waiting in the queue (02 Marks)

e. waiting time of the system (02 Marks)

(Total Marks - 16)