Uva Wellassa University

Faculty of Management

Degree of Bachelor of Business Management in Entrepreneurship and Management

THIRD YEAR SECOND SEMESTER EXAMINATION –SEPTEMBER/OCTOBER 2015

EMG 374 -3 Scientific Decision Making

Instructions to candidates:

No. of pages : Five (05)
No. of questions : Six (06) Essay
Time allocation : Three (03) Hours
Marks allocated :100 Marks

Answer **all** questions. You may state clearly the assumptions made if any.
Question paper is not to be removed from the examination hall.

Index Number:

01. Sithma Enterprise produces two types of products, Sigma and Gamma using three distinct processes; mixing, producing and finishing. The estimated times required in hours for each product in each process are summarized below.

	Sigma	Gamma
Mixing	10	8
Producing	20	6
Finishing	3	3

The management accountant of Sithma Enterprise has budgeted the following revenues and costs for the next quarter.

	Sigma (Rs. Per unit)	Gamma(Rs. Per unit)
Selling price	4,000	6,000
Variable cost	3,250	4,000

Fixed cost for the three (03) months period is Rs.150,000. The production manager has identified that the total time available for the period considered will be 2,400 hours and 3,000 hours for mixing and producing respectively. Further, to satisfy the established customers' requirements at least 50 units of each product should be manufactured.

You are required to;

i) Determine the optimal production plan using linear programming technique. [use graphical method] (12 Marks)

(21)

ii) Calculate the shadow prices of binding constraints and comment on the usefulness of shadow price in decision making. (05 Marks)

iii) Set up initial simplex table for above linear programming problem (05 Marks)

iv) State whether the simplex table in part (iii) above gives the optimum answer to the problem. (03 Marks)

(Total Marks-25)

02.

i) What is meant by 'Degeneracy' in transportation problem? (03 Marks)

ii) You are given the following transportation problem. The table shows the quantity demanded by each destination and the quantity supplied by each origins and the respective cost of transporting one unit from each origin to each destinations.

		Destination				
Source		D_1	D_2	D_3	D_4	Supply
	O_1	5	3	9	3	1200
	O_2	6	5	4	8	1000
	O_3	10	10	20	7	600
	Demand	400	1000	1100	900	

You are required to determine the number of units to be transported from each supply origin to the demand destinations in order to minimize the transportation cost. (Use the North West Corner Rule for determining the initial basic solution and test the optimality using the stepping stone method) (12 Marks)

(Total Marks-15)

03.

i) 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. Advise the marketing manager by providing the optimal assignment of sales representatives. (07 Marks)

ii) The business development manager of Synergy PLC is planning to develop three (03) business proposals to be presented to the Board of Directors of the company. The manager has identified three (03) business analysts who are capable in developing such proposals and he has estimated the time (no. of hours) required by each business analyst to develop each of the business proposals as shown in the following matrix.

Business Analyst	Business Proposals		
	I	II	III
A_1	170	160	150
A_2	140	150	170
A_3	180	200	180

a) Find how the three (03) business analysts should be assigned to develop the three proposals within minimum time duration (03 Marks)

b) If the standard costs per hour for the three (03) analysts are Rs.100, Rs.125 and Rs.110 for A_1, A_2 and A_3 respectively, Calculate the total cost of these three assignments if assigned as part (a) above (02 Marks)

c) Show the initial matrix of the assignment of business analysts that would minimize the total cost of developing the business proposals using the standard cost of each analyst given in part (b) above. (03 Marks)

(Total Marks-15)

04.

i) Briefly explain the three commonly used criteria for decision making when probability information regarding the likelihood of the states of nature is unavailable. (05Marks)

ii) Ease life PLC is a diversified business organization, now considering on expanding its business to agricultural insurance products in Uva province. At the moment, the company has two courses of actions, to conduct a market survey to test the feasibility of introducing new insurance product to Uva province or terminate the temporary staff to reduce the staff cost. If the company conducts the marketing survey, it will cost Rs.35,000 and the market response could be positive or negative with probabilities of 0.6 and 0.4, respectively. If the market response is positive the company could either introduce new product or terminate the service of temporary staff.

If the company introduces the new policy, the outcome might be low, moderate or high demand. The respective net payoffs of possible outcomes and the probability information are given below.

Out come	**Net Pay off (Rs)**	**Probability**
Low Demand	(50,000)	0.2
Moderate demand	100,000	0.5
High Demand	500,000	0.3

If the response of marketing survey is negative, the company can either introduce the new product or not. If the company goes ahead and introduces the new policy to Uva province with negative response the estimated losses would be Rs.100,000. If the company does not introduce the new agricultural insurance policy at any point the company can save Rs.75,000 per month. All the relevant financial values have been discounted to the present.

You are required to identify the decision that should be taken by the company. (Use decision tree diagram) (10 Marks)

(Total Marks-15)

05. Petro Mart service station operates a single petrol pump. Vehicles arrive according to a poison distribution at an average rate of 24 vehicles 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. (02 Marks)

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

iii. length of the system (02 Marks)

iv. length of the queue (02 Marks)

v. waiting time of the system (02 Marks)

(Total Marks-10)

06. The following set of activities, precedence relationships and activity times have been predicted with respect to a particular project.

Activity	Immediate predecessors	Time Estimates (weeks)		
		Optimistic time	Most Likely time	Pessimistic time
A	-	6	8	10
B	-	13	16	19
C	F,D	4	6	8
D	B	8	12	24
E	-	10	14	18
F	A	18	32	34
G	B	16	24	32
H	G	16	20	24
I	K	10	14	18
J	E	14	16	30
K	G,J	18	22	26

The project will be completed when activities C,H,I are completed.

You are required to;

i) Draw the network diagramme for this project (10 Marks)

ii) Show the critical path of the project and determine the normal time duration expected to be spent on completing the project (10 Marks)

(Total Marks-20)

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