SOUTH EASTERN UNIVERSITY OF SRI LANKA

THIRD EXAMINATION IN BACHELOR OF BUSINESS ADMINISTRATION / BACHELOR OF COMMERCE – 2007/2008
SEMESTER – II, AUGUST/SEPTEMBER 2009

MIS 3205 – MATHEMATICAL PROGRAMMING

Answer all questions considering the marks given and allocate your time accordingly. Calculator is allowed.

Time: 03 Hours

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01. a) Explain the methodology of Management Science, and list out the uses and advantages of Management Science model.

(6 Marks)

b) Identify 10 basic requirements of Linear Programming problem.

(4 Marks)

c) Assuming that you operate a retail business. You want to know how many clerks you need to hire, and what days to assign them to, to minimize your labor cost while meeting your needs at the store. There are two limiting factors that govern how many people you hire and what days they work.

First, each of your workers receives $300 per week for a regular schedule, with $25 extra for Saturday work and $35 extra for Sunday work. Each worker can work only five days a week, and must have two consecutive days off.

Second, you have minimum staffing needs which must be met. In table form, that requirement looks like this:

DAY	M	T	W	Th	F	S	Su
REQ	20	13	10	12	16	18	20

i. Formulate a Linear Programming model for the above problem

(8 Marks)

ii. The LINDO solver gives you the following report. Do the sensitivity analysis.

LP OPTIMUM FOUND AT STEP 8

OBJECTIVE FUNCTION VALUE

1) 7750.000

VARIABLE	VALUE	REDUCED COST
MWORK	2.000000	0.000000
TWORK	0.000000	100.000000
WWORK	2.000000	0.000000
THWORK	7.000000	0.000000
FWORK	5.000000	0.000000
SWORK	4.000000	0.000000
SUWORK	2.000000	0.000000

ROW	SLACK OR SURPLUS	DUAL PRICES
MON)	0.000000	-100.000000
TUE)	0.000000	0.000000
WED)	0.000000	-100.000000
THU)	1.000000	0.000000
FRI)	0.000000	-100.000000
SAT)	0.000000	-25.000000
SUN)	0.000000	-135.000000

NO. ITERATIONS= 8

RANGES IN WHICH THE BASIS IS UNCHANGED:

OBJ COEFFICIENT RANGES

VARIABLE	CURRENT COEF	ALLOWABLE INCREASE	ALLOWABLE DECREASE
MWORK	300.000000	150.000000	300.000000
TWORK	325.000000	INFINITY	100.000000
WWORK	360.000000	150.000000	300.000000
THWORK	360.000000	0.000000	100.000000
FWORK	360.000000	150.000000	0.000000
SWORK	360.000000	150.000000	25.000000
SUWORK	335.000000	25.000000	100.000000

RIGHTHAND SIDE RANGES

ROW	CURRENT RHS	ALLOWABLE INCREASE	ALLOWABLE DECREASE
MON	20.000000	3.000000	1.500000
TUE	13.000000	1.000000	5.000000
WED	10.000000	7.500000	1.500000
THU	12.000000	1.000000	INFINITY
FRI	16.000000	6.000000	1.500000
SAT	18.000000	1.000000	4.000000
SUN	20.000000	3.000000	1.500000

(12 Marks)

d) As the leader of an oil exploration drilling venture, you must select the best 5 sites out of 10 possible sites. Label the sites S_1, S_2,……S_{10} and the expected profits associated with each as P_1, P_2,….. P_{10} respectively.

- If site S_2 is explored, then site S_3 must also be explored. Furthermore, regional development restrictions are such that,
- Exploring site S_1 and S_7 will prevent you from exploring site S_8.
- Exploring site S_3 or site S_4 will prevent you from exploring site S_5.

Formulate an integer program to determine the best exploration scheme.

(5 Marks)
(Total 35 Marks)

02.

a) Consider the following problem.

Max 3A +5B

S.T. A + 4 B <= 9
2A + 3B <= 11

A,B > = 0

If we ignore integrality, we get the following optimal tableau.

Cj	Basis	A(3)	B(5)	S1	S2	Qty
5	B	0	1	2/5	-1/5	7/5
3	A	1	0	-3/5	4/5	17/5
	Zj	3	5	1/5	7/5	86/5
	Cj - Zj	0	0	-1/5	-7/5	

Find out the optimal integer solution using **Cutting & Plan Method.**

(15 Marks)

b) Suppose we wish to invest $14,000. We have identified four investment opportunities. Investment 1 requires an investment of $5,000 and has a present value (a time-discounted value) of $8,000; investment 2 requires $7,000 and has a value of $11,000; investment 3 requires $4,000 and has a value of $6,000; and investment 4 requires $3,000 and has a value of $4,000.

Formulate the LP model for the above problem

(3 Marks)

Ignoring integrality constraint, solution of the optimal linear programming is,

Investment 1 = 1
Investment 2 = 1
Investment 3 = 0.5
Investment 4 = 0

Using **Branch and Bound** method, decide in which investments money should be placed to maximize the total present value?

(12 Marks)

c) List out 10 LINDO model syntax.

(5 Marks)

(Total 35 Marks)

03.

a) Explain two approaches of Dynamic Programming.

(5 Marks)

b) Use the Dynamic Programming approach (Backward Recursive Equation) to find the shortest route between city1 to city7. The distance (d) between possible routes are given below.

d(1- 2) = 7
d(1- 3) = 8

d(1- 4) = 5
d(2- 5) =12
d(3- 5) = 8
d(3- 6) = 9
d(4- 5) = 7
d(4- 6) = 13
d(5- 7) = 9
d(6- 7) = 6

(13 Marks)
(Total 18 Marks)

04. Explain the following.

a) Knapsack
b) Relationship between Linear and Integer Programming
c) Optimal structure in Dynamic Programming
d) Optional Modeling Statements in LINDO.

(Total 12 Marks)