Post Graduate Diploma in Insurance Management

Data Analytics

INS 408

Trimester-IV, End Term Examination, September 2015

Time: 2 Hrs and 30 Minutes Marks: 50

Roll No._____

Instruction: Students are required to write Roll No on every page of the question paper, writing anything except the Roll No will be treated as **Unfair Means.** *In case of rough work please use answer sheet.*

Section A

(Attempt any three 5 x 3=15 marks)

QA1. Write your understanding on 100% rule of Sensitivity Analysis

QA2. Find the weight of the following pair wise comparison matrix using additive normalization.

$$\begin{pmatrix} 1.000 & 0.500 & 0.200 \\ 2.000 & 1.000 & 0.500 \\ 5.000 & 2.000 & 1.000 \end{pmatrix}$$

QA3. Develop the CCR model to optimize the output for the firm D from the following data:

Firm	Capital Employed (Rs million)	Value Added (Rs million)	No of employees (in 000)
A	8.6	1.8	1.8
B	2.2	0.2	1.7
C	15.6	2.8	2.6
D	31.6	4.1	12.3

QA4. Write the dual of the following primal problem

Minimize $3x_1-2x_2+x_3$

Subject to

$2x_1-3x_2+x_3 = 1$

$2x_1+3x_2 \geq 8$

$x_j \geq 0$ for all j

QA5. Enumerate typical inputs and outputs for performance measurement of a Business School.

Section B

(Attempt any two 10 x2=20 marks)

QB1. Godwell Engineering products is an agricultural equipment manufacturer which faces cash flow problem because of the cyclic nature of agricultural sector.

The company has the following short-term financing problem:

Month	Jan	Feb	Mar	Apr	May	Jun
Net cash flow	-150	-100	200	-200	50	300

Net cash flow requirements are given in thousands of dollars. The company has the following sources of funds:

- A line of credit of up to \$100k at an interest rate of 1% per month;
- In any of the first three months, it can issue 90-day commercial paper bearing a total interest of 2% for the three-month period;
- Excess funds can be invested at an interest rate of 0.3% per month.

Questions:

Formulate the mathematical model to optimize the wealth in the month of June satisfying the above requirements.

QB2. Anderson electronics is considering the production of four potential products: VCRs, Stereos, TVs and DVD players. For the sake of this study, let us assume that the inputs for all products can be viewed in terms of three resources: electronic components, non-electronics components and assembly time. The composition of four products in terms of these three inputs is shown below.

	VCR	Stereo	TV	DVD player	Supply
Elec. Components	3	4	4	3	4700
Non-Elec. Components	2	2	4	3	4500
Assembly time (hours)	1	1	3	2	2500
Selling price (per unit)	70	80	150	110	

Electronics components can be obtained at \$7 per unit; non-electronics components can be obtained at \$5 per unit; assembly time costs \$10 per hour. Each resource is available in limited quantities as shown above.

The computer output of the sensitivity report for the problem are as follows.

Adjustable Cells

Cell	Name	Final Value	Reduced Cost	Objective Coefficient	Allowable Increase	Allowable Decrease
B8	solution V	0	-1	29	1	1E+30
C8	solution S	380	0	32	39.99999	1.666666
D8	solution T	0	-8.000003	72	8.000003	1E+30
E8	solution D	1060	0	54	10	4.99998

Constraints

Cell	Name	Final Value	Shadow Price	Constraint R.H. Side	Allowable Increase	Allowable Decrease
B12	elec LHS	4700	2	4700	2800	950
B13	non-elec LHS	3940	0	4500	1E+30	560
B14	assembly LHS	2500	24	2500	466.66666	1325

Questions:

a) Formulate LP as maximization of profit.

Based on the sensitivity report answer the followings.

b) What if the supply of nonelectrical components changes?

c) What happens if the supply of electrical components
   i. Increased by 200?
   ii. Increased by 3000?

d) What if we could get an additional 250 hours of assembly time by paying $5 per hour more than usual? Would this be profitable?

e) We are not currently making any VCR's (V=0) because they are not profitable enough. How much would profit need to increase before we would want to begin making VCR's?

f) If DVD players sold at $106, what would be Anderson's new total profit?

QB3. Five data (number of employees, capital, and deposits, loans and investments) for some banks are given below. Capital is measured by the book value of fixed assets and premises, and deposits are measured by the sum of long-term and saving deposits. Similarly, loans include loans to individuals, real estate loans, and commercial and industrial loans. Investments are measured using the value of all securities, other than those held in a bank's trading accounts. Capital, deposits, loans and investments are measured in appropriate money units (US$).

Banks	Loans	Investments	Employees	Capital	Deposits
1	945	233	520	91	3457
2	85	20	43	8	299
3	1200	323	643	109	4203
4	12	4	21	1	40
5	43	8	19	3	198
6	249	40	112	19	892
7	546	98	286	25	1417
8	325	75	215	20	999
9	1513	387	680	121	4802

Answer the followings:

1. Which of the variables are considered as inputs and which of the variables are considered as outputs? Give your justifications.
2. Write the input oriented DEA (CCR) programs for DMU 8 for estimating the efficiency of Bank.

Section C

(Compulsory: 15 marks)

A new author sets three criteria for selecting a publisher for an OR text book: royalty percentage (R), marketing (M) and advance payment (A). Two publishers H and P have expressed interest in the book. Using the following comparison matrix, rank the two publishers and asses the consistency of the decision.

$$A = \begin{array}{c} \\ R \\ M \\ A \end{array}\begin{array}{c} \begin{matrix} R & M & A \end{matrix} \\ \begin{pmatrix} 1 & 1 & \frac{1}{4} \\ 1 & 1 & \frac{1}{5} \\ 4 & 5 & 1 \end{pmatrix} \end{array}$$

$$A_R = \begin{array}{c} \\ H \\ P \end{array}\begin{array}{c} \begin{matrix} H & P \end{matrix} \\ \begin{pmatrix} 1 & 2 \\ \frac{1}{2} & 1 \end{pmatrix} \end{array} \qquad A_M = \begin{array}{c} \\ H \\ P \end{array}\begin{array}{c} \begin{matrix} H & P \end{matrix} \\ \begin{pmatrix} 1 & 1/2 \\ 1 & 1 \end{pmatrix} \end{array} , \qquad A_A = \begin{array}{c} \\ H \\ P \end{array}\begin{array}{c} \begin{matrix} H & P \end{matrix} \\ \begin{pmatrix} 1 & 1 \\ 1 & 1 \end{pmatrix} \end{array}$$

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