PGDM (IBM), 2015-17

Data Analytics

INS-308

Trimester – III, End-Term Examination: March 2016

Time allowed: 2 hrs 30 min
Max 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 3 out of 5 questions, each question carries 5 marks.

1. What do you meant by a mathematical model of real life situation? Discuss the importance of models in the solution of optimization problems.
2. Explain AHP with some examples.
3. Food A contains 20 units of Vitamin X and 40 units of Vitamin Y per gram. Food B contains 30 units each of Vitamin X and Vitamin Y per gram. The daily minimum human requirements of vitamin X and Y are 900units and 1200 units, respectively. Formulate L P to find how many grams of each type of food should be consumed so as to minimize the cost if food A costs Re. 60 per gram and food B costs Re. 0.80 per gram? Write its Dual Problem.
4. i) What are the assumptions of linear programming? Explain with the help of examples.

   ii) Write your understanding on following:
   a) Feasible solution
   b) Infeasibility solution
   c) Unbounded solution
   d) Alternative optimal solution
5. Evening shift resident doctors in a government hospital work five consecutive days and have two consecutive days off. Their five days of work can on any day of the week and their schedule rotates indefinitely. The hospital requires the following minimum number of doctors to work on the given days:

Sun	Mon	Tues	Wed	Thus	Fri	Sat
35	55	60	50	60	50	45

No more than 45 doctors can start their five working days on the same day. Formulate this problem as an LP model to minimize the number of doctors employed by the hospital.

Section – B: Attempt any 2 out of 3 questions, each question carries 10 marks.

1. A wholesale company has three warehouses from which supplies are drawn for four retail Customers Company deals in single product the supplies of which at each warehouse are:

Warehouse	Supply (units)	Customer no	Demand (units)
1	20	1	15
2	28	2	19
3	17	3	13
		4	18

Conveniently, total supply at the warehouse is equal to total demand from the customers. The following table gives the transportation costs per unit shipment from each warehouse to each customer.

		Customer no			
		1	2	3	4
Warehouse	1	3	6	8	5
	2	6	1	2	5
	3	7	8	3	9

Determine what supplies to dispatch from each of the warehouse to each customer so as minimizes overall transportation cost.

2. A company manufactures two products A & B both the product passes through two machines M1 & M2. The time required to process each unit of products A & B on each machine & available capacity of each machine is given below.

Product	M1 (time per units)	M2 (time per units)
A	6	2
B	4	4
Available Capacity (hrs)	3600	2000

The profits on product A and B are Rs. 100 and Rs. 150 respectively. Solve the problem to get the optimal solution.

3. Test the consistency of the following pair-wise comparison matrix.

$$\begin{pmatrix} 1 & 4 & 6 \\ 1/4 & 1 & 7 \\ 1/6 & 1/7 & 1 \end{pmatrix}$$

Section-C: Compulsory Case Study (15 Marks)

Bluegrass Farms, located in Lexington, Kentucky, has been experimenting with a special diet for its racehorses. The feed components available for the diet are a standard horse feed product, a vitamin-enriched oat product, and a new vitamin and mineral feed additive. The nutritional values in units per pound and the costs for the three feed components are summarized in the following Table; for example, each pound of the standard feed components contains 0.8 unit of ingredient A, 1 unit of ingredient B, and 0.1 unit of ingredient C. The minimum daily diet requirements for each horse are three units of ingredient A, six units of ingredient B, and four units of ingredient C. In addition, to control the weight of the horses, the total daily feed for a horse should not exceed 6 pounds. Bluegrass Farms would like to determine the minimum-cost mix that will satisfy the daily diet requirements.

Table: Nutritional Value and Cost Data for the Bluegrass Farms Problem.

Feed Component	Standard	Enriched Oat	Additive
Ingredient A	0.8	0.2	0.0
Ingredient B	1.0	1.5	3.0
Ingredient C	0.1	0.6	2.0
Cost per pound	$0.25	$0.50	$3.00

Microsoft Excel Sensitivity Report

Adjustable Cells

Cell	Name	Final Value	Reduced Cost	Objective Coefficient	Allowable Increase	Allowable Decrease
C3	S	3.514	0.000	0.25	1E+30	0.642857143
D3	E	0.946	0.000	0.5	0.425	1E+30
E3	A	1.541	0.000	3	1E+30	1.47826087

Constraints

Cell	Name	Final Value	Shadow Price	Constraint R.H. Side	Allowable Increase	Allowable Decrease
F7		3.000	1.216	3	0.368421053	1.857142857
F8		9.554	0.000	6	3.554054054	1E+30
F9		4.000	1.959	4	0.875	1.9
F10		6.000	-0.919	6	2.478260869	0.4375

a) Why all reduced costs for this problem are zero?

b) Interpret the shadow price of the constraints table.

c) Explain the range of the Adjustable cells table.