

PGDM / PGDM (RM), 2015-17

Management Science

DM-201B / RM-202

Trimester – II, End-Term Examination: December 2015

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 from this section. Each question carries 5 marks .

Question 1 Suppose you are going on a trip to a city that is d miles away. Develop a model that determines your round –trip gasoline costs. What assumptions or approximations are necessary to treat this model as a linear programming model? Are these assumptions or approximations acceptable to you?

Question 2 The New England Cheese Company produces two cheese spreads by blending mild cheddar cheese with extra sharp cheddar cheese. The cheese spreads are packaged in 12-ounce containers, which are then sold to distributors throughout the Northeast. The Regular blend contains 80% mild cheddar and 20% extra sharp and the Zesty blend contains 60% mild cheddar and 40% extra sharp. This year, a local dairy cooperative offered to provide up to 8100 pounds of mild cheddar cheese for \$1.20 per pound and up to 3000 pounds of extra sharp cheddar cheese for \$1.40 per pound. The cost to blend and package the cheese spreads, excluding the cost of the cheese, is \$0.20 per container. If each container of Regular is sold for \$1.95 and each container of Zesty is sold for \$2.20, how many containers of Regular and Zesty should New England Cheese produce?

Question 3: How an integer programming is different form linear programming? Explain it with mathematical model,

Question 4 'Linear programming is one of the most frequently and successfully applied operations research technique to managerial decisions.' Elucidate this statement with an example.

Question 5 What is an assignment problem? Develop its mathematical model.

Attempt any 2 out of 3 questions from this section. Each question carries 10 marks.

Question 1 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
\$C\$3	S	3.514	0.000	0.25	1E+30	0.642857143
\$D\$3	E	0.946	0.000	0.5	0.425	1E+30
\$E\$3	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
\$F\$7		3.000	1.216	3	0.368421053	1.857142857
\$F\$8		9.554	0.000	6	3.554054054	1E+30
\$F\$9		4.000	1.959	4	0.875	1.9
\$F\$10		6.000	-0.919	6	2.478260869	0.4375

- Why all reduced costs for this problem are zero?
- Interpret the shadow price of last row of constraints table.
- What is the range for the 2nd row of the constraint table?

Question 2 Test the consistency of the following pair-wise comparison matrix.

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

Question 3 A company makes two kinds of leather belts, belt A and belt B. Belt A is high quality belt and belt B is of lower quality. The respective profits are Rs. 4 and Rs. 3 per belt. The production of each of type A requires twice as much time as a belt of type B, and if all belts were of type B, the company could make 1,000 belts per day. The supply of leather is sufficient for only 800 belts per day (both A and B combined). Belt A requires a fancy buckle and only 400 of these are available per day. There are only 700 buckles a day available for belt B. Formulate this problem as an LP model and also develop the dual of the formulated model.

Section - C

Compulsory Case Study (15 Marks)

Sanjay Krishnan, manager at an ICICI branch, is attempting to improve customer satisfaction by offering service such that (1) the average customer waiting time does not exceed 2 minutes and (2) the average queue length is 2 or fewer customers. The bank gets an average of 150 customers each day. Given the following service and arrival times, does the bank meet Sanjay's criteria?

SERVICE TIME	PROBABILITY	TIME BETWEEN ARRIVALS	PROBABILITY
1	0.25	0	0.10
2	0.20	1	0.15
3	0.40	2	0.10
4	0.15	3	0.35
		4	0.25
		5	0.05

Consider the following random numbers to use for simulation. First column be used for service time and second column be used for time between arrivals.

0.932791	0.831362
0.226499	0.54857
0.926087	0.215208
0.497368	0.94391
0.097777	0.485711
0.618105	0.634272
0.646554	0.236715
0.161981	0.793792
0.044903	0.727798
0.139887	0.8938
0.055187	0.821568
0.686665	0.869449
0.716331	0.149107
0.698339	0.999026
0.43046	0.831929
0.681608	0.643681
0.579987	0.855805
0.615193	0.833213
0.396046	0.035824
0.433453	0.007064