

**PGDM (RM), 2016
Management Science
RM206**

Trimester – II, End-Term Examination: Dec 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 from this section. Each question carries 5 marks .

- Question 1 Under what conditions is it possible for an LP problem to have more than one optimum solution?
- Question 2 Prentice Hall, Inc., a publisher headquartered in New Jersey, want to assign three recently hired college graduate, Jones, Smith and Wilson to regional sales district in Omaha, Dallas and Miami. But the firm also has an opening in New York and would sent one of the three there if it were more economical than a move to Omaha, Dallas, or Miami. It will cost \$1000 to relocate Jones to New York, \$800 to relocate Smith there, and \$1500 to move Wilson. What is the optimal assignment of personnel to office?

Office	OMAHA	MIAMI	DALLAS
Hiree			
Jones	\$800	\$1,100	\$1,200
Smith	\$500	\$1,600	\$1,300
Wilson	\$500	\$1,000	\$2,300

- Question 3 What is additive normalization in AHP?
- Question 4 It is important to understand the assumptions underlying the use of any quantitative analysis model. What are assumptions and requirements for an LP model to be formulated and used?
- Question 5 Construct a network for a project having the following activities and activity time and find the critical path:

ACTIVITY	A	B	C	D	E	F	G
PREDECESSOR	-	-	A	A	C, B	C, B	D, E
TIME (MONTH)	4	6	2	6	3	3	5

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

- Question 1 The Long Last Appliance Sales Company is in the business of selling appliances such as microwave ovens, traditional ovens, refrigerators, dishwashers, washers, dryers, and the like. The company has stores in the greater Chicagoland area and has a monthly advertising budget of \$90,000. Among its options are radio advertising, advertising in the cable TV channels, newspaper advertising, and direct-mail advertising. A 30-second advertising spot on the local cable channel costs \$1,800, a 30-second radio ad costs \$350, a half-page ad in the local newspaper costs \$700, and a single mailing of direct-mail insertion for the entire region costs \$1,200 per mailing. The number of potential buying customers reached per advertising medium usage is as follows:

Radio	7,000
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TV	50,000
Newspaper	18,000
Direct mail	34,000

Due to company restrictions and availability of media, the maximum number of usages of each medium is limited to the following:

Radio	35
TV	25
Newspaper	30
Direct mail	18

The management of the company has met and decided that in order to ensure a balanced utilization of different types of media and to portray a positive image of the company, at least 10 percent of the advertisements must be on TV. No more than 40 percent of the advertisements can be on radio. The cost of advertising allocated to TV and direct mail cannot exceed 60 percent of the total advertising budget. Formulate the model which would optimally allocate of the budget among the four media also write down its dual?

Question 2 An organization was investigating relocation its corporate headquarters to one of the three possible cities. The pair wise comparison matrix shows the president's judgment regarding the desirability for the three cities.

$$\begin{pmatrix} 1 & 5 & 8 \\ 1/5 & 1 & 6 \\ 1/8 & 1/6 & 1 \end{pmatrix}$$

- i. Determine the priorities for the three cities.
- ii. Is the President consistent in terms of the judgment provided? Explain.

Question 3 Don Yale, President of Hardrock Concrete Company has plants in three locations and is currently working on three major construction projects, located at different sites. The shipping cost per truckload of concrete, plant capacities, and project requirement are provided in the accompanying table. Formulate an initial feasible solution to Hardrock's transportation problem and test the optimality of the solution.

To	Project A	Project B	Project C	Plant Capacities
From				
Plant 1	\$10	\$4	\$11	70
Plant 2	\$12	\$5	\$8	50
Plant 3	\$9	\$7	\$6	30
Project Requirements	40	50	60	150

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
\$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

- Develop a LP model. What is the optimal solution, and what is the total profit? What is the plan for the use of overtime?
- Referring to the sensitivity report, write down the intervals for profit coefficients and resources.
- Referring to the sensitivity report, explain the Reduced cost and shadow Price.