

PGDM (IB)
Management Science
IB-304

Trimester – III, End-Term Examination: March 2018

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**. All other instructions on the reverse of Admit Card should be followed meticulously.

Sections	No. of Questions to attempt	Marks	Marks
A	3 out of 5 (Short Questions)	5 Marks each	3*5 = 15
B	2 out of 3 (Long Questions)	10 Marks each	2*10 = 20
C	Compulsory Case Study	15 Marks	15
		Total Marks	50

Section A

- Are assignment models designed only for minimization problems? Justify your answer.
- Determine the criteria weights using following matrix

	A	B	C	D
A	1	3	5	1/6
B	1/3	1	2	1/8
C	1/5	1/2	1	1/9
D	6	9	9	1

- Why sensitivity analysis is important for business decision making? Explain using a suitable example.
- A winemaking company has recently acquired a 110 hectares piece of land. Due to the quality of the sun and the region's excellent climate, the entire production of Sauvignon Blanc and Chardonnay grapes can be sold. You want to know how to plant each variety in the 110 hectares, given the costs, net profits and labor requirements according to the data shown below:

Variety	Cost (\$/Hectare)	Net Profit (\$/Hectare)	Man days/Hectare
Sauvignon Blanc	100	50	10
Chardonnay	200	120	30

The company has a budget of US\$10,000 and an availability of 1,200 man-days during the planning horizon. Solve this problem using graphical method in order to maximize total profit.

- Solve following assignment problem:

	Time taken (hours)			
	Task 1	Task 2	Task 3	Task 4
Machine 1	13	4	7	6
Machine 2	1	11	5	4
Machine 3	6	7	2	8
Machine 4	1	3	5	9

Section B

6. A publishing house publishes three weekly magazines, Daily Life, Agriculture Today, and Surf's Up. The publication of a single issue of each of these three magazines requires the following amounts of production time and paper:

Magazine	Production (hours)	Paper (kg)
Daily Life	0.01	0.2
Agriculture Today	0.03	0.5
Surf's Up	0.02	0.3

Each week the publisher has available 120 hours of production time and 300 kgs of paper. The total circulation of all magazines should exceed 5,000 issues per week, if the company is to keep its advertisers. The selling price per issue is ₹22.5 for Daily Life, ₹40 for Agriculture Today, and ₹15 for Surf's Up. Based on past sales, the publisher knows that maximum weekly demand for Daily life is 3,000 issues, for Agriculture Today is 2,000 issues and for Surf's Up is 6000 issues. The production Manager wants to know the number of issues of each magazine to produce per week in order to maximize total sales revenue. Write the dual formulation of the problem.

7. Tucker Inc. needs to produce 1000 Tucker automobiles. The company has four production plants. Due to differing workforces, technological advances, and so on, the plants difference in the cost of producing each car. They also use a different amount of labor and raw material at each. This is summarized in the following table:

Plant	Cost ('000s)	Labor (hrs)	Material
1	15	2	3
2	10	3	4
3	9	4	5
4	7	5	6

The labor contract signed requires at least 400 cars to be produced at plant 3; there are 3300 hours of labor and 4000 units of material that can be allocated to the four plants. Write a linear formulation for production at each plant minimizing total cost.

Variable Cells

Cell	Name	Final Value	Reduced Cost	Objective Coefficient	Allowable Increase	Allowable Decrease
\$E\$3	X1	400	0	15	1E+30	3.5
\$E\$4	X2	200	0	10	2	1E+30
\$E\$5	X3	400	0	9	1E+30	4
\$E\$6	X4	0	7	7	1E+30	7

Constraints

Cell	Name	Final Value	Shadow Price	Constraint R.H. Side	Allowable Increase	Allowable Decrease
\$B\$11	Labor	3000	0	3300	1E+30	300
\$B\$12	Material	4000	-5	4000	300	200
\$B\$13	units	1000	30	1000	66.66666667	100
\$B\$14	X3	400	4	400	100	400

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Considering the sensitivity report shown answer following questions

1. What are the current production quantities? What is the current cost of production?

2. How much will it cost to produce one more vehicle? How much will we save by producing one less?
 3. How would our solution change if it cost only \$8,000 to produce at plant 2?
 4. For what ranges of costs is our solution (except for the objective value) valid for plant 2?
 5. What would be the value of reducing the 400 car limit down to 200 cars? To 0 cars?
8. When do you use Analytical Hierarchical Process for decision making? Discuss the step by step process in detail.

Section C: Case Study

A company has 4 factories situated in different locations in the country and four sales agencies located in four other regions. The cost of production, shipping cost, selling price at sales agencies and monthly factory capacities and requirements are summarized in the table. Find the optimal solution maximizing total profit.

Production Cost:

Factory	Production Cost
A	10
B	15
C	16
D	15

Selling Price:

Sales Agency	Selling Price
Mumbai	23
Delhi NCR	22
Hyderabad	25
Coimbatore	21

Shipping Cost:

Sales agency/ Factory	Mumbai	Delhi NCR	Hyderabad	Coimbatore	Supply
A	7	5	6	4	10
B	3	5	4	2	15
C	4	6	4	5	20
D	8	7	6	5	15
Requirements	8	12	18	22	
