JAIPURIA INSTITUTE OF MANAGEMENT, NOIDA

PGDM / PGDM (M) / PGDM (SM)

SECOND TRIMESTER (Batch 2017-19)

MID TERM EXAMINATIONS, NOVEMBER 2017

Course Name	Management Science	Course Code	OP 201
Max. Time	1 hour	Max. Marks	20 MM

INSTRUCTIONS: Attempt all questions

Q. No.-1 For the linear program;

$$MaxZ = 2A + 3B$$

Subject to

$$A + 2B \leq 6$$
$$5A + 3B \leq 15$$
$$A, B \geq 0$$

Find optimal solution and value of objective function at the optimal solution.　　　**(Marks 5)**

Q. No.-2 Better Products, Inc., manufactures three products on two machines. In a typical week, 40 hours are available on each machine. The profit contribution and production time in hours per unit are as follows:

Category	Product 1	Product 2	Product 3
Profit/unit	$30	$50	$20
Machine 1 time/unit	0.5	2.0	0.75
Machine 2 time/unit	1.0	1.0	0.5

Two operators are required for machine 1; thus, 2 hours of labor must be scheduled for each hour of machine 1 time. Only one operator is required for machine 2. A maximum of 100 labor-hours is available for assignment to the machines during the coming week. Other production requirements are that product 1 cannot account for more than 50% of the units produced and that product 3 must account for at least 20% of the units produced.

Microsoft Excel 14.0 Sensitivity Report

Variable Cells

Cell	Name	Final Value	Reduced Cost	Objective Coefficient	Allowable Increase	Allowable Decrease
E4	P1	25	0	30	1E+30	10
F4	P2	0	-7.5	50	7.5	1E+30
G4	P3	25	0	20	10	4.285714286

Constraints

Cell	Name	Final Value	Shadow Price	Constraint R.H. Side	Allowable Increase	Allowable Decrease
H10	Min P3	15	0	0	15	1E+30
H6	Machine1	31.25	0	40	1E+30	8.75
H7	Machine2	37.5	0	40	1E+30	2.5
H8	Labor	100	12.5	100	6.666666667	100
H9	Max P1	0	10	0	5	25

Note: Let P1 = units of product 1, P2 = units of product 2 and P3 = units of product 3

Bases on available information and sensitivity report please answer following questions:

a. Develop a linear programming model to select the best mix of products for Better Products, Inc.
(Marks 3)

b. How many units of each product should be produced to maximize the total profit contribution? What is the projected weekly profit associated with your solution? (Marks 2)

c. How many hours of production time will be scheduled on each machine? (Marks 2)

d. What is the value of an additional hour of labor? (Marks 1)

e. Assume that labor capacity can be increased to 105 hours. Would you be interested in using the additional 5 hours ($15/hour) available? (Marks 2)

Q. No.-3 The Ranch House, Inc., operates five fast-food restaurants. Input measures for the restaurants include weekly hours of operation, full-time equivalent staff, and weekly supply expenses. Output measures of performance include average weekly contribution to profit, market share, and annual growth rate. Data for the input and output measures are shown in the following tables:

Restaurant	Input Measures		
	Hours of Operation	FTE Staff	Supplies ($)
Bardstown	96	16	850
Clarksville	110	22	1400
Jeffersonville	100	18	1200
New Albany	125	25	1500
St. Matthews	120	24	1600

Restaurant	Output Measures		
	Weekly Profit	Market Share (%)	Growth Rate (%)
Bardstown	$3800	25	8.0
Clarksville	$4600	32	8.5
Jeffersonville	$4400	35	8.0
New Albany	$6500	30	10.0
St. Matthews	$6000	28	9.0

Develop a linear programming model that can be used to evaluate the performance of the New Albany Ranch House restaurant. (Marks 5)