Sensitivity Analysis in LP.

"A manufacturer produces two types of plastic cladding. These have the trade names Ankalor and Beslite. One yard of Ankalor requires 8 lb of polyamine, 2.5 lb of diurethane and 2 lb of monomer. A yard of Beslite needs 10 lb of polyamine, 1 lb of diurethane, and 4 lb of monomer. The company has in stock 80,000 lb of polyamine, 20,000 lb of diurethane, and 30,000 lb of monomer. Both plastics can be produced by alternate parameter settings of the production plant, which is able to produce sheeting at the rate of 12 yards per hour. A total of 750 production plant hours are available for the next planning period. The contribution to profit on Ankalor is $10/yard and on Beslite is $20/yard.
The company has a contract to deliver at least 3,000 yards of Ankalor. What production plan should be implemented in order to maximize the contribution to the firm's profit from this product division."

Definition of variables:

A = Number of yards of Ankalor produced
B = Number of yards of Beslite produced

LP model:

1) Maximize 10 A + 20 B subject to
2) 8 A + 10 B ≤80,000 (lbs. Polyamine available)
3) 2.5 A + 1 B ≤ 20,000 (lbs. Diurethane available)
4) 2 A + 4 B ≤ 30,000 (lbs. Monomer available)
5) A + B ≤ 9,000 (lbs. Plant capacity)
6) A ≥ 3,000 (Contract)

A ≥ 0, B ≥ 0

The LINDO solution is:

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         OBJECTIVE FUNCTION VALUE
             1)   142000.000
        VARIABLE         VALUE     REDUCED COST
            A          3000.000        0.000
            B          5600.000        0.000

       ROW         SLACK OR SURPLUS  DUAL PRICES
        2)                 0.000          2.000
        3)              6900.000          0.000
        4)              1600.000          0.000
        5)               400.000          0.000
        6)                 0.000         -6.000

 RANGES IN WHCH THE BASIS IS UNCHANGED

                              OBJ COEFFICIENT RANGES
     VARIABLE     CURRENT     ALLOWABLE   ALLOWABLE
                    COEF      INCREASE    DECREASE
        A          10.000       6.000    INFINITY
        B          20.000     INFINITY      7.500

                             RIGHTHAND SIDE RANGES
     ROW           CURRENT       ALLOWABLE     ALLOWABLE
                     RHS          INCREASE      DECREASE
      2          80000.000       4000.000      56000.000
      3          20000.000       INFINITY       6900.000
      4          30000.000       INFINITY       1600.000
      5           9000.000       INFINITY        400.000
      6           3000.000       2000.000       1333.333
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THE TABLEAU

ROW	(BASIS)	A	B	SLK 2	SLK 3	SLK 4	SLK 5
1	ART	.000	.000	2.000	.000	.000	.000
2	B	.000	1.000	.100	.000	.000	.000
3	SLK 3	.000	.000	-.100	1.000	.000	.000
4	SLK 4	.000	.000	-.400	.000	1.000	.000
5	SLK 5	.000	.000	-.100	.000	.000	1.000
6	A	1.000	.000	.000	.000	.000	.000

ROW	SLK 6	RHS
1	6.0	0.14E+06
2	.800	5600.000
3	1.700	6900.000
4	-1.200	1600.000
5	.200	400.000
6	-1.000	3000.000

Consult the LINDO output above to answer the following questions. If there is not sufficient information in the LINDO output, answer "NSI".

1. How many yards of Beslite should be manufactured? _____

2. How much of the available diurethane will be used? _____

3. How much of the available diurethane will be unused? _____

4. Suppose that the company can purchase 2000 pounds of additional polyamine for $2.50 per pound. Should they make the purchase? [__] yes [__] no [__] *NSI*

___ 5. Regardless of your answer in (4), suppose that they do purchase 2000 pounds of additional polyamine. This is equivalent to

a. decreasing the slack in row 2 by 2000
b. increasing the surplus in row 2 by 2000
c. increasing the slack in row 2 by 2000
d. decreasing the surplus in row 2 by 2000
e. none of the above
f. *NSI*

6. If the company purchases 2000 pounds of additional polyamine, what is the total amount of Beslite that they should deliver? _____

7. How will the decision to purchase 2000 pounds of additional polyamine change the quantity of diurethane used during the next planning period? _____

8. If the profit contribution from Beslite were to decrease to $11/yard, will the optimal solution change? [__] yes [__] no [__] *NSI*

9. If the profit contribution from Ankelor were to increase to $15/yard, will the optimal solution change? [__] yes [__] no [__] *NSI*

10. Suppose that the company could deliver 1000 yards less than the contracted amount of Ankalor by paying a penalty of $5/yard shortage. Should they do so? [__] yes [__] no [__] *NSI*