GLPK 4.65 - SENSITIVITY ANALYSIS REPORT Page 1 Problem: Objective: OBJ = 7730351.199 (MAXimum) No. Row name St Activity Slack Lower bound Activity Obj coef Obj value at Lim iting Marginal Upper bound range range break point var iable 1 Factory_A,_Time_1___Labor_met_by_standard_and_overtime
BS 1162.00000 1338.00000 -Inf 779.91209 -3.13579 7.72671e+06 fac toryB widgets 1 . 2500.00000 2716.00000 19.28153 7.75276e+06 fac toryA flugels 1 2 Factory_A,_Time_2___Labor_met_by_standard_and_overtime BS . 2500.00000 -Inf -Inf -5.50000 7.73035e+06 ove rtime factoryA 2 . 2500.00000 1187.50000 .98150 7.73035e+06 fac toryA widgets 2 3 Factory_A,_Time_3___Labor_met_by_standard_and_overtime BS 1433.31535 1066.68465 -Inf 473.24074 -.03974 7.73029e+06 sto rage factoryA gadgets 3 . 2500.00000 1757.50000 7.73035e+06 Raw Material 2 Limits time 3 4 Factory_A,_Time_4___Labor_met_by_standard_and_overtime
BS 844.92539 1655.07461 -Inf 520.74074 7.73035e+06 Raw _Material_2_Limits___time_3 . 2500.00000 1805.00000 7.73035e+06 fac toryB widgets 5 5 Factory_A,_Time_5___Labor_met_by_standard_and_overtime BS 1900.00000 600.00000 -Inf 939.92539 7.73035e+06 fac toryB widgets 5 . 2500.00000 2640.42146 23.76997 7.77551e+06 fac toryA flugels 5 6 Factory_A_Storage_limit time 1 NU 70.00000 -Inf 66.12154 -3139.83500 7.71817e+06 Inf ${\tt lows_Balanced_for_Factory_A__widgets__time_4}$ 3139.83500 70.00000 71.56379 +Inf 7.73526e+06 Fac tory A Storage limit time 2 7 Factory A Storage limit time 2 68.43621 1.56379 -Inf 18.43621 -.20000 7.73034e+06 sto rage factoryB gadgets 2 68.43621 6.50000 7.7308e+06 sto 70.00000 rage factoryA flugels 2 8 Factory_A_Storage_limit___time_3 -Inf -Inf 7.73035e+06 BS 70.00000 6.93699 5.50000 7.73035e+06 sto 70.00000 rage factoryA gadgets 3 9 Factory_A_Storage_limit___time_4 -Inf • BS 70.00000 -Inf 7.73035e+06 5.50000 7.73035e+06 sto 70.00000 rage factoryA gadgets 4 10 Factory_A_Storage_limit___time_5 -Inf 7.73035e+06 -Inf BS . 70.00000 +Inf 7.73035e+06 70.00000 GLPK 4.65 - SENSITIVITY ANALYSIS REPORT Page 2 Problem: Objective: OBJ = 7730351.199 (MAXimum) Obj coef Obj value at Lim No. Row name St Activity Slack Lower bound Activity iting Marginal Upper bound range range break point var iable 11 Factory_B,_Time_1__Labor_met_by_standard_and_overtime

BS 3434.00000 366.00000 -Inf -Inf -5.50000 7.71146e+06 ove rtime factoryB 1 . 3800.00000 4071.00000 3.27363 7.74159e+06 fac toryB widgets 1 rtime factoryB 2 rtime factoryB 3 rtime factoryB 4 rtime factoryB 5 NU 50.00000 . -Inf 46.12154 -3405.69500 7.71714e+06 Inf lows_Balanced_for_Factory_A__widgets___time_4 tory A Storage limit time 2 17 Factory_B_Storage_limit___time_2 50.00000 -Inf . -Inf 7.73035e+06 . 50.00000 68.43621 .20000 7.73035e+06 sto BS . 50.00000 rage factoryB gadgets 2 18 Factory_B_Storage_limit___time_3 -Inf 7.73035e+06 BS . -Inf 50.00000 . 50.00000 6.93699 5.70000 7.73035e+06 sto rage factoryB gadgets 3 19 Factory_B_Storage_limit___time_4 0.00000 -Inf . -Inf 7.73035e+06 50.00000 19.68724 5.70000 7.73035e+06 sto 50.00000 BS . rage factoryB gadgets 4 20 Factory_B_Storage_limit___time_5 -Inf -Inf 7.73035e+06 +Inf 7.73035e+06 BS . 50.00000 50.00000 GLPK 4.65 - SENSITIVITY ANALYSIS REPORT Page 3 Problem: Objective: OBJ = 7730351.199 (MAXimum) No. Row name St Activity Slack Lower bound Activity Obj coef Obj value at Lim iting Marginal Upper bound range range break point var iable 21 Inflows_Balanced_for_Factory_A___flugels___time_1 . -10.35638 -531.02833 7.73035e+06 sto rage factoryA flugels 1 +Inf 120.54054 214.02500 7.73035e+06 fac toryA flugels 1 22 Inflows_Balanced_for_Factory_A___flugels___time_2 -6.50000 7.73035e+06 sto -1.56379 rage factoryA flugels 2 +Inf 54.54085 276.37679 7.73035e+06 fac toryA flugels 2 23 Inflows Balanced for Factory A flugels time 3 -70.00000 -6.50000 7.73035e+06 sto rage factoryA flugels 3 +Inf 6.50000 7.73035e+06 sto rage factoryA flugels 2 24 Inflows Balanced for Factory A flugels time 4 -51.00802 -6.50000 7.73035e+06 sto rage factoryA flugels 4 +Inf 6.50000 7.73035e+06 sto rage factoryA flugels 3 25 Inflows Balanced for Factory A flugels time 5 -Inf 7.73035e+06 +Inf 6.50000 7.73035e+06 sto rage factoryA flugels 4 26 Inflows Balanced for Factory A gadgets time 1 -46.92308 -Inf 7.74284e+06 Fac tory B, Time 1 Labor met by standard and overtime -266.06000 +Inf 188.45070 266.06000 7.68021e+06 Fac tory A, Time [1] Labor_met_by_standard_and_overtime 27 Inflows Balanced for Factory A gadgets time 2 1.56379 -1.56379 7.73033e+06 Raw -15.77853 Material 2 Limits time 2 .20000 +Inf 51.56379 7.73035e+06 sto rage factoryB gadgets 2 28 Inflows_Balanced_for_Factory_A___gadgets___time_3 68.43621 -68.43621 18.43621 -.20000 7.73034e+06 sto rage factoryB gadgets 2 +Inf 70.00000 15.77853 7.73143e+06 Raw Material 2 Limits time 2 29 Inflows Balanced for Factory A gadgets time 4 -19.68724 -5.50000 7.73035e+06 sto rage factoryA gadgets 4 +Inf 6.93699 5.50000 7.73035e+06 sto rage factoryA gadgets 3 30 Inflows Balanced for Factory A gadgets time 5 -Inf 7.73035e+06 +Inf 5.50000 7.73035e+06 sto rage factoryA gadgets 4 GLPK 4.65 - SENSITIVITY ANALYSIS REPORT Page 4 Problem: Objective: OBJ = 7730351.199 (MAXimum) No. Row name St Activity Slack Lower bound Activity Obj coef Obj value at Lim iting Marginal Upper bound range range break point var iable 31 Inflows_Balanced_for_Factory_A___widgets___time_1 BS 70.00000 -70.00000 29.78022 -29.79000 7.72827e+06 fac toryB widgets 1 +Inf 70.00000 508.93489 7.76598e+06 sto rage factoryB widgets 1 32 Inflows Balanced for Factory A widgets time 2 -1.93522 -8.79844 7.73035e+06 sto rage factoryA widgets 2 +Inf 125.00000 9.32422 7.73035e+06 fac toryA widgets 2 33 Inflows_Balanced_for_Factory_A__widgets___time_3 BS 150.87530 -150.87530 49.81481 -.37753 7.73029e+06 sto rage factoryA gadgets 3 +Inf 185.00000 7.73035e+06 Raw Material 2 Limits time 3 34 Inflows_Balanced_for_Factory_A___widgets___time_4 BS 88.93952 -88.93952 54.81481 7.73035e+06 Raw Material 2 Limits time 3 +Inf 190.00000 7.73035e+06 fac toryB widgets 5 35 Inflows_Balanced_for_Factory_A___widgets___time_5 BS 200.00000 -200.00000 98.93952 7.73035e+06 fac toryB widgets 5 +Inf 212.44232 956.35463 7.92162e+06 mar keting widgets 4 36 Inflows_Balanced_for_Factory_B___flugels___time_1 BS 140.00000 -140.00000 19.45946 -214.02500 7.70039e+06 fac toryA flugels 1 +Inf 140.00000 531.02833 7.8047e+06 sto rage factoryA flugels 1 37 Inflows_Balanced_for_Factory_B___flugels___time_2 BS 356.48148 -356.48148 306.48148 -7.00000 7.72786e+06 sto rage factoryB flugels 2 +Inf 363.42593 167.83604 7.79018e+06 fac toryA widgets 2 38 Inflows_Balanced_for_Factory_B___flugels___time_3 BS 313.75233 -313.75233 . 312.54793 7.73035e+06 Raw Material 2 Limits time 3 +Inf 363.75233 7.00000 7.73255e+06 sto rage factoryB flugels 2 39 Inflows_Balanced_for_Factory_B___flugels___time_4 BS 286.00802 -286.00802 282.44118 7.73035e+06 fac toryB widgets 5 7.73035e+06 Raw +Inf 287.21242 Material 2 Limits time 3 40 Inflows_Balanced_for_Factory_B___flugels___time_5 BS $\frac{-}{277.64706} \frac{-}{-277.64706}$ 221.04928 -251.98839 7.66039e+06 fac toryA flugels 5 +Inf 281.21390 7.73035e+06 fac toryB widgets 5 GLPK 4.65 - SENSITIVITY ANALYSIS REPORT Page 5 Problem: Objective: OBJ = 7730351.199 (MAXimum) No. Row name St Activity Slack Lower bound Activity Obj coef Obj value at Lim iting Marginal Upper bound range range break point var iable 41 Inflows_Balanced_for_Factory_B___gadgets___time_1
BS 200.00000 -200.00000 .
lows_Balanced_for_Factory_A___gadgets___time_1 -266.06000 7.67714e+06 Inf 11.54930 +Inf 200.00000 +Inf +Inf 42 Inflows_Balanced_for_Factory_B___gadgets___time_2 248.43621 -.20000 7.73029e+06 sto rage factoryB gadgets 2 15.77853 7.73506e+06 Raw +Inf 300.00000 Material 2 Limits time 2 43 Inflows_Balanced_for_Factory_B___gadgets___time_3 BS 226.56379 -226.56379 225.00000 -15.77853 7.72678e+06 Raw Material 2 Limits time 2 7.7304e+06 sto .20000 +Inf 276.56379 rage factoryB gadgets 2 44 Inflows_Balanced_for_Factory_B___gadgets___time_4 BS 245.00000 -245.00000 . 238.06301 -5.50000 7.729e+06 sto rage factoryA gadgets 3 +Inf 245.00000 5.50000 7.7317e+06 sto rage factoryA gadgets 4 45 Inflows_Balanced_for_Factory_B___gadgets___time_5 BS 240.00000 -240.00000 . -5.50000 7.72903e+06 sto 240.00000 rage factoryA gadgets 4 244.77884 1656.28722 8.12786e+06 mar +Inf keting gadgets 4 46 Inflows_Balanced_for_Factory_B___widgets___time_1 -12.81626 -508.93489 7.73035e+06 sto rage factoryB widgets 1 +Inf 40.21978 29.79000 7.73035e+06 fac toryB widgets 1 47 Inflows_Balanced_for_Factory_B___widgets___time_2 BS 125.00000 -125.00000 -9.32422 7.72919e+06 fac toryA widgets 2 +Inf 125.00000 8.79844 7.73145e+06 sto rage factoryA widgets 2 48 Inflows_Balanced_for_Factory_B___widgets___time_3 BS 34.12470 -34.12470 . 7.73035e+06 Raw _Material_2_Limits___time_3 .37753 7.73036e+06 sto +Inf 135.18519 rage factoryA gadgets 3 $49 \ {\tt Inflows_Balanced_for_Factory_B__widgets__time_4}$ BS 101.06048 -101.06048 7.73035e+06 fac toryB widgets 5 +Inf 135.18519 7.73035e+06 Raw Material 2 Limits time 3 50 Inflows_Balanced_for_Factory_B___widgets___time_5 BS . -Inf 7.73035e+06 101.06048 +Inf 7.73035e+06 fac toryB widgets 5 GLPK 4.65 - SENSITIVITY ANALYSIS REPORT Page 6 Problem: Objective: OBJ = 7730351.199 (MAXimum) No. Row name St Activity Slack Lower bound Activity Obj coef Obj value at Lim iting Marginal Upper bound range range break point var iable 51 Inflows_and_Outflows_of_Production_Equal___flugels___time_1 NS 140.00000 . 140.00000 -Inf 7.33791e+06 Inf lows_Balanced_for_Factory_B___flugels___time_1 2803.18500 140.00000 174.52830 +Inf 7.82714e+06 Fac tory B, Time 1 Labor met by standard and overtime 52 Inflows_and_Outflows_of_Production_Equal___flugels___time_2 NS 175.00000 . 175.00000 171.43316 -Inf 7.72968e+06 Inf ${\tt lows_Balanced_for_Factory_B__widgets__time_4}$ 187.87833 175.00000 +Inf 7.73094e+06 Inf 178.13904 ${\tt lows_Balanced_for_Factory_A__widgets__time_4}$ 53 Inflows_and_Outflows_of_Production_Equal___flugels___time_3 NS 205.00000 . 205.00000 201.43316 -Inf 7.72968e+06 Inf lows_Balanced_for_Factory_B___widgets___time_4 187.87833 205.00000 208.13904 +Inf 7.73094e+06 Inf lows Balanced for Factory A widgets time 4 54 Inflows_and_Outflows_of_Production_Equal___flugels___time_4 NS 235.00000 .
lows_Balanced_for_Factory_B__widgets___time_4 235.00000 231.43316 -Inf 7.72968e+06 Inf 238.13904 187.87833 235.00000 +Inf 7.73094e+06 Inf lows Balanced for Factory A widgets time 4 55 Inflows_and_Outflows_of_Production_Equal___flugels___time_5 226.43316 7.72968e+06 Inf 230.00000 . 230.00000 -Inf ${\tt lows_Balanced_for_Factory_B__widgets_} \quad {\tt time} \ 4$ 187.87833 230.00000 233.13904 +Inf 7.73094e+06 Inf lows_Balanced_for_Factory_A___widgets time 4 56 Inflows_and_Outflows_of_Production_Equal___gadgets___time_1 200.00000 200.00000 -Inf 7.35318e+06 Inf lows_Balanced_for_Factory_B___gadgets time 1 1885.86000 200.00000 246.92308 +Inf 7.81884e+06 Fac tory_B,_Time_1___Labor_met_by_standard_and_overtime 57 Inflows_and_Outflows_of_Production_Equal___gadgets___time_2 300.00000 300.00000 298.43621 -Inf 7.73274e+06 Fac tory_A_Storage_limit___time_2 -1525.53500 300.00000 303.87846 +Inf 7.72443e+06 Inf 58 Inflows_and_Outflows_of_Production_Equal___gadgets___time_3 295.00000 295.00000 292.65761 -Inf 7.73394e+06 Inf lows_Balanced_for_Factory_B___widgets time 3 -1531.03500 295.00000 298.87846 +Inf 7.72441e+06 Inf lows_Balanced_for_Factory_A___widgets___time_4 59 Inflows_and_Outflows_of_Production_Equal___gadgets___time_4 245.00000 245.00000 242.30505 -Inf 7.73448e+06 Inf ${\tt lows_Balanced_for_Factory_B__widgets_} \quad {\tt time} \ 4$ -1531.03500 245.00000 247.37172 +Inf 7.72672e+06 Inf lows_Balanced_for_Factory_A___widgets___time_4 60 Inflows_and_Outflows_of_Production_Equal___gadgets___time_5 240.00000 240.00000 237.30505 -Inf 7.73448e+06 Inf lows_Balanced_for_Factory_B___widgets_ time 4 -1531.03500 240.00000 242.37172 +Inf 7.72672e+06 Inf lows_Balanced_for_Factory_A___widgets time 4 GLPK 4.65 - SENSITIVITY ANALYSIS REPORT Page 7 Problem: Objective: OBJ = 7730351.199 (MAXimum) No. Row name St Activity Slack Lower bound Activity Obj coef Obj value at Lim iting Marginal Upper bound range range break point var iable ${\tt 61~Inflows_and_Outflows_of_Production_Equal__widgets__time_1}$ NS 70.00000 70.00000 -Inf 7.58238e+06 Inf ${\tt lows_Balanced_for_Factory_A__widgets} \quad {\tt time} \ 1$ 2113.91000 70.00000 210.84211 +Inf 8.02808e+06 Fac tory_A,_Time_1___Labor_met_by_standard_and_overtime 62 Inflows_and_Outflows_of_Production_Equal___widgets___time_2 125.00000 125.00000 121.45864 -Inf 7.73315e+06 Inf lows_Balanced_for_Factory_B___widgets_ time 4 -790.65011 125.00000 128.11662 +Inf 7.72789e+06 Inf ${\tt lows_Balanced_for_Factory_A__widgets__time_4}$ 63 Inflows_and_Outflows_of_Production_Equal___widgets___time_3 185.00000 185.00000 181.45864 -Inf 7.73315e+06 Inf lows_Balanced_for_Factory_B___widgets_ time 4 -789.35167 185.00000 188.11662 +Inf 7.72789e+06 Inf ${\tt lows_Balanced_for_Factory_A__widgets__time_4}$ 64 Inflows and Outflows of Production Equal widgets time 4 190.00000 190.00000 186.87442 -Inf 7.73282e+06 Inf ${\tt lows_Balanced_for_Factory_B__widgets__time_4}$ -789.35167 190.00000 192.83850 +Inf 7.72811e+06 Inf ${\tt lows_Balanced_for_Factory_A__widgets__time_4}$ 65 Inflows_and_Outflows_of_Production_Equal___widgets___time_5 NS 200.00000 . 200.00000 196.87442 -Inf 7.73282e+06 Inf lows_Balanced_for_Factory_B___widgets___time_4 -789.35167 200.00000 202.75071 +Inf 7.72818e+06 Inf lows_Balanced_for_Factory_A___widgets time 4 66 Marketing Budget NU 70000.00000 -Inf 69357.96868 -.04377 7.73032e+06 Inf lows_Balanced_for_Factory_B__widgets___time 4 .04377 70000.00000 70565.02751 +Inf 7.73038e+06 Inf lows Balanced for Factory A widgets time 4 67 Raw Material 1 Limits time 1 BS 109730.00000 30270.00000 -Inf 109488.68132 -4.96500 7.18554e+06 fac toryB widgets 1 . 140000.00000 110694.32432 26.75313 1.0666e+07 fac toryA flugels 1 68 Raw Material 1 Limits time 2 NU 140000.00000 -Inf 139127.34641 -14.97109 7.71729e+06 Inf lows_Balanced_for_Factory_A__widgets___time_4 14.97109 140000.00000 140351.85185 +Inf 7.73562e+06 Fac tory_A_Storage_limit___time_2 69 Raw_Material_1_Limits___time_3 NU 140000.00000 -Inf 139127.34641 -14.93833 7.71732e+06 Inf lows_Balanced_for_Factory_A___widgets___time_4 14.93833 140000.00000 140527.03704 +Inf 7.73822e+06 Inf lows Balanced for Factory B widgets time 3 70 Raw Material 1 Limits time 4 NU 140000.00000 -Inf 139466.36291 -14.93833 7.72238e+06 Inf ${\tt lows_Balanced_for_Factory_A__widgets__time_4}$ 14.93833 140000.00000 140606.36291 +Inf 7.73941e+06 Inf lows_Balanced_for_Factory_B___widgets___time_4 GLPK 4.65 - SENSITIVITY ANALYSIS REPORT Page 8 Problem: Objective: OBJ = 7730351.199 (MAXimum) No. Row name St Activity Slack Lower bound Activity Obj coef Obj value at Lim iting Marginal Upper bound range range break point var iable 71 Raw_Material_1_Limits___time_5 NU 140000.00000 -Inf 139466.36291 -14.93833 7.72238e+06 Inf ${\tt lows_Balanced_for_Factory_A__widgets__time_4}$ 14.93833 140000.00000 140606.36291 +Inf 7.73941e+06 Inf lows Balanced for Factory B widgets time 4 72 Raw_Material_2_Limits___time_1
BS 2114.00000 2886.00000 -Inf 2114.00000 -Inf -inc
. 5000.00000 2184.06861 28.22964 7.79003e+06 sto rage factoryA widgets 1 73 Raw Material 2 Limits time 2 -Inf 4977.64706 -1.10385 7.73033e+06 Fac tory A Storage limit time 2 1.10385 5000.00000 5099.15817 +Inf 7.73046e+06 Inf lows_Balanced_for_Factory_B___widgets time 4 74 Raw Material 2 Limits time 3 NU 5000.00000 -Inf 4966.51765 7.73035e+06 Inf lows Balanced for Factory B widgets time 3 5000.00000 5099.15817 +Inf 7.73035e+06 Inf lows Balanced for Factory B widgets time 4 75 Raw Material 2 Limits time 4 BS 4783.52288 216.47712 -Inf 4684.36471 . 7.73035e+06 fac toryB widgets 5 5000.00000 4817.00523 7.73035e+06 Raw Material 2 Limits time 3 76 Raw Material 2 Limits time 5 BS 4718.58824 281.41176 -115.87195 7.1836e+06 mar -Inf 4650.27894 keting gadgets 4 5000.00000 4817.74641 7.73035e+06 fac toryB widgets 5 GLPK 4.65 - SENSITIVITY ANALYSIS REPORT Page 9 Problem: Objective: OBJ = 7730351.199 (MAXimum) No. Column name St Activity Obj coef Lower bound Activity Obj coef Obj value at Lim iting Marginal Upper bound range range break point var iable 1 factoryA flugels 1 -Inf 7.73035e+06 Inf 2589.16000 lows Balanced for Factory A flugels time 1 2803.18500 7.70455e+06 Fac -214.02500+Inf 120.54054 tory A, Time 1 Labor met by standard and overtime 2 factoryA flugels 2 2589.16000 -Inf 7.73035e+06 Inf lows Balanced for Factory A flugels time 2 +Inf 2865.53679 7.71528e+06 Inf -276.37679 54.54085 lows Balanced for Factory A widgets time 4 3 factoryA flugels 3 2583.05500 -Inf 7.73035e+06 Inf lows Balanced for Factory A flugels time 3 2846.90167 7.71596e+06 Inf -263.84667 +Inf 54.54085 lows Balanced for Factory A widgets time 4 4 factoryA flugels 4 2583.05500 -Inf 7.73035e+06 Inf lows Balanced for Factory A flugels time 4 -263.84667 +Inf 66.70464 2846.90167 7.71275e+06 Inf lows Balanced for Factory A widgets time 4 5 factoryA flugels 5 2583.05500 -Inf 7.73035e+06 Inf lows_Balanced_for_Factory_A flugels time 5 2846.90167 7.71609e+06 Fac -263.84667 +Inf 54.05405 tory A, Time 5 Labor met by standard and overtime 6 factoryA gadgets 1 70.00000 1619.80000 61.85249 1377.02511 7.71336e+06 sto rage factoryA widgets 1 +Inf 258.45070 1885.86000 7.74898e+06 Inf lows Balanced for Factory A gadgets time 1 7 factoryA gadgets 2 1619.80000 -1.52979 -Inf 7.73081e+06 Inf lows Balanced for Factory A gadgets time 2 174.53072 1917.81544 7.67834e+06 Inf -298.01544 +Inf lows Balanced for Factory A widgets time 4 8 factoryA gadgets 3 1615.89500 -Inf 7.75012e+06 Inf -68.43621 lows Balanced for Factory A gadgets time 3 1904.78167 7.67993e+06 Inf -288.88667 +Inf 174.53072 lows Balanced for Factory A widgets time 4 9 factoryA gadgets 4 NL1615.89500 -Inf 7.73035e+06 Inf lows Balanced for Factory A gadgets time 4 -288.88667 +Inf 106.72742 1904.78167 7.69952e+06 Inf lows Balanced for Factory A widgets time 4 10 factoryA gadgets 5 1615.89500 -Inf 7.73035e+06 Inf lows_Balanced_for_Factory_A___gadgets___time_5 84.50704 1904.78167 7.70594e+06 Fac +Inf tory_A,_Time_5___Labor_met_by_standard_and_overtime GLPK 4.65 - SENSITIVITY ANALYSIS REPORT Page 10 Problem: Objective: OBJ = 7730351.199 (MAXimum) No. Column name St Activity Obj coef Lower bound Activity Obj coef Obj value at Lim iting range break point var Marginal Upper bound range iable 11 factoryA widgets 1 2113.91000 BS 70.00000 29.78022 2084.12000 7.72827e+06 fac toryB widgets 1 7.74735e+06 sto +Inf 78.14751 2356.68489 rage factoryA widgets 1 12 factoryA widgets 2 2113.91000 -Inf 7.73035e+06 Inf lows Balanced for Factory A widgets time 2 -9.32422 +Inf 125.00000 2123.23422 7.72919e+06 Inf lows Balanced for Factory B widgets time 2 13 factoryA widgets 3 150.87530 2108.68500 49.81481 2108.30747 7.73029e+06 sto rage factoryA gadgets 3 185.00000 2108.68500 +Inf 7.73035e+06 Raw _Material_2_Limits___time_3 14 factoryA widgets 4 88.93952 2108.68500 54.81481 2108.68500 7.73035e+06 Raw _Material_2_Limits___time_3 190.00000 7.73035e+06 fac +Inf 2108.68500 toryB widgets 5 15 factoryA widgets 5 BS 200.00000 7.73035e+06 fac 2108.68500 98.93952 2108.68500 toryB widgets 5 212.44232 +Inf 3065.03963 7.92162e+06 mar keting widgets 4 16 factoryB flugels 1 BS 140.00000 2803.18500 19.45946 2589.16000 7.70039e+06 fac toryA flugels 1 140.00000 3334.21333 7.8047e+06 sto +Inf rage factoryA flugels 1 17 factoryB flugels 2 356.48148 356.48148 2792.85639 2803.18500 7.72667e+06 sto rage factoryA widgets 2 +Inf 363.42593 2971.02104 7.79018e+06 fac toryA widgets 2 18 factoryB flugels 3 312.54793 2791.52500 7.73035e+06 Raw 313.75233 2791.52500 _Material_2_Limits___time_3 313.75233 7.73359e+06 sto +Inf 2801.85361 rage factoryA widgets 2 19 factoryB flugels 4 BS 286.00802 2791.52500 282.44118 2791.52500 7.73035e+06 fac toryB widgets 5 287.21242 +Inf 2791.52500 7.73035e+06 Raw Material 2 Limits time 3 20 factoryB flugels 5 7.66039e+06 fac BS 277.64706 2791.52500 221.04928 2539.53661 toryA flugels 5 +Inf 281.21390 2791.52500 7.73035e+06 fac toryB widgets 5 GLPK 4.65 - SENSITIVITY ANALYSIS REPORT Page 11 Problem: Objective: OBJ = 7730351.199 (MAXimum) No. Column name St Activity Obj coef Lower bound Activity Obj coef Obj value at Lim iting range Marginal Upper bound range break point var iable 21 factoryB gadgets 1 1619.80000 7.66384e+06 Inf 1885.86000 BS 250.00000 61.54930 lows_Balanced_for_Factory_A__ gadgets time 1 250.00000 +Inf +Inf +Inf 22 factoryB gadgets 2 248.43621 248.43621 1885.86000 1840.01905 7.71896e+06 sto rage factoryA widgets 2 250.00000 +Inf 1901.63853 7.73427e+06 Raw Material 2 Limits time 2 23 factoryB gadgets 3 226.56379 1877.28000 225.00000 1861.50147 7.72678e+06 Raw Material 2 Limits time 2 1882.78000 +Inf 233.50078 7.7316e+06 sto rage factoryA gadgets 3 24 factoryB gadgets 4 245.00000 1877.28000 238.06301 1871.78000 7.729e+06 sto rage factoryA gadgets 3 +Inf 245.00000 1882.78000 7.7317e+06 sto rage factoryA gadgets 4 25 factoryB gadgets 5 240.00000 1877.28000 240.00000 1871.78000 7.72903e+06 sto rage factoryA gadgets 4 3533.56722 +Inf 244.77884 8.12786e+06 mar keting gadgets 4 26 factoryB widgets 1 7.73035e+06 Inf 2084.12000 -Inf lows Balanced for Factory B widgets time 1 -29.79000 +Inf 40.21978 2113.91000 7.72915e+06 Fac tory B, Time 1 Labor met by standard and overtime 27 factoryB widgets 2 BS 125.00000 2084.12000 2074.79578 7.72919e+06 fac toryA widgets 2 2092.91844 7.73145e+06 sto +Inf 125.00000 rage factoryA widgets 2 28 factoryB widgets 3 34.12470 2074.11000 2074.11000 7.73035e+06 Raw Material 2 Limits time 3 7.73036e+06 sto +Inf 135.18519 2074.48753 rage factoryA gadgets 3 29 factoryB widgets 4 BS 101.06048 2074.11000 2074.11000 7.73035e+06 fac toryB widgets 5 135.18519 7.73035e+06 Raw +Inf 2074.11000 Material 2 Limits time 3 30 factoryB widgets 5 2074.11000 7.73035e+06 Inf -Inf lows_Balanced_for_Factory_B___widgets time 5 2074.11000 7.73035e+06 Inf +Inf 101.06048 lows Balanced for Factory B widgets time 4 GLPK 4.65 - SENSITIVITY ANALYSIS REPORT Page 12 Objective: OBJ = 7730351.199 (MAXimum) No. Column name St Activity Obj coef Lower bound Activity Obj coef Obj value at Lim iting Marginal Upper bound range range break point var iable 31 marketing flugels 1 181.48148 BS -180.00000 181.48148 -186.50000 7.72917e+06 sto rage factoryA flugels 2 -12.16396 7.76081e+06 fac +Inf 188.42593 toryA widgets 2 32 marketing flugels 2 BS 108.75233 -180.00000 107.54793 -180.00000 7.73035e+06 Raw Material 2 Limits time 3 -173.50000 7.73106e+06 sto +Inf 108.75233 rage factoryA flugels 2 33 marketing flugels 3 51.00802 BS -180.00000 47.44118 -180.00000 7.73035e+06 fac toryB widgets 5 +Inf 52.21242 -180.00000 7.73035e+06 Raw Material 2 Limits time 3 34 marketing flugels 4 BS 47.64706 -180.00000 33.44818 -1018.04272 7.69042e+06 mar keting widgets 4 +Inf 51.21390 -180.00000 7.73035e+06 fac toryB widgets 5 35 marketing gadgets 1 -120.00000 -1.56379 -Inf 7.73293e+06 Fac tory A Storage limit time 2 1530.78722 7.71326e+06 Inf -1650.78722 +Inf 10.35638 lows Balanced for Factory A widgets time 3 36 marketing gadgets 2 -120.00000 -2.34239 -Inf 7.73423e+06 Inf lows_Balanced_for_Factory_B___widgets___time_3 -1656.28722+Inf 10.35638 1536.28722 7.7132e+06 Inf lows Balanced for Factory A widgets time 3 37 marketing gadgets 3 -120.00000 -5.43012 -Inf 7.73935e+06 Inf lows_Balanced_for_Factory_B___widgets___time_4 1536.28722 7.72244e+06 Inf -1656.28722 +Inf 4.77884 lows Balanced for Factory A widgets time 4 38 marketing gadgets 4 -120.00000 -5.43012 -Inf 7.73935e+06 Inf lows_Balanced_for_Factory_B___widgets___time_4 1536.28722 7.72244e+06 Inf -1656.28722+Inf 4.77884 lows Balanced for Factory A widgets time 4 39 marketing widgets 1 -160.00000 -8.14751 -Inf 7.73815e+06 Fac tory A Storage limit time 2 -957.65307 +Inf 26.53339 797.65307 7.70494e+06 Inf lows_Balanced_for_Factory_A widgets time 4 40 marketing widgets 2 -160.00000 -8.98926 -Inf 7.73895e+06 Inf lows Balanced for Factory B widgets time 3 26.53339 796.35463 7.70498e+06 Inf -956.35463 +Inf lows Balanced for Factory A widgets time 4 GLPK 4.65 - SENSITIVITY ANALYSIS REPORT Page 13 Problem: Objective: OBJ = 7730351.199 (MAXimum) No. Column name St Activity Obj coef Lower bound Activity Obj coef Obj value at Lim iting Marginal Upper bound range range break point var iable 41 marketing widgets 3 -14.13800 -Inf 7.74387e+06 Inf -160.00000 lows Balanced for Factory B widgets time 4 +Inf 14.46607 796.35463 7.71652e+06 Inf -956.35463 lows Balanced for Factory A widgets time 4 42 marketing widgets 4 -14.13800 -160.00000 -Inf 7.74387e+06 Inf lows Balanced for Factory B widgets time 4 -956.35463 +Inf 12.44232 796.35463 7.71845e+06 Inf lows Balanced for Factory A widgets time 4 43 overtime factoryA 1 -5.50000 -1338.00000 -Inf 7.73771e+06 Fac tory A, Time 1___Labor_met_by_standard_and_overtime -5.50000 +Inf +Inf -Inf 44 overtime factoryA 2 -Inf 7.7441e+06 Fac NL-5.50000 -2500.00000 tory A, Time 2 Labor met by standard and overtime -5.50000 +Inf +Inf -Inf 45 overtime factoryA 3 -1066.68465 -5.77500 -Inf 7.73651e+06 Fac tory A, Time 3 Labor met by standard and overtime -5.77500 +Inf +Inf -Inf 46 overtime factoryA 4 NL-5.77500 -1655.07461 -Inf 7.73991e+06 Fac tory A, Time 4 Labor met by standard and overtime -5.77500 +Inf +Inf -Inf 47 overtime factoryA 5 -600.00000 -5.77500 -Inf 7.73382e+06 Fac tory A, Time 5 Labor met by standard and overtime -5.77500 +Inf +Inf -Inf 48 overtime factoryB 1 -Inf 7.73236e+06 Fac NL-5.50000 -366.00000 tory B, Time 1 Labor met by standard and overtime -5.50000 +Inf +Inf -Inf 49 overtime factoryB 2 BS 3054.00617 -5.50000 -6.53070 7.7272e+06 fac 1923.19136 toryA widgets 2 +Inf +Inf 7.74715e+06 Fac tory B, Time 2 Labor met by standard and overtime 50 overtime factoryB 3 1280.20559 BS 1603.50702 -6.05000 -6.05000 7.73035e+06 Raw Material 2 Limits time 3 +Inf 2517.75257 -6.00827 7.73042e+06 sto rage factoryA gadgets 3 GLPK 4.65 - SENSITIVITY ANALYSIS REPORT Page 14 Problem: Objective: OBJ = 7730351.199 (MAXimum) No. Column name St Activity Obj coef Lower bound Activity Obj coef Obj value at Lim iting Marginal Upper bound range range break point var iable 51 overtime factoryB 4

