Assignment 1

Monday, January 15, 2024 1:15 PM

13. Let x_1 be cat-cracked, x_2 be isopentane and x_3 be straight gas in barels used for lo-lead gasoline

Let x_4 be cat-cracked, x_5 be isopentane and x_6 be straight gas in barels used for premium gasoline

Let y_1, y_2 be the total # of barels of lo-lead and premium gasoline, respectively

Maximize $19.80y_1 + 22y_2 + 19\left[(2700 - x_1 - x_4) + (1350 - x_2 - x_5) + (4100 - x_3 - x_6)\right]$

Subject to: $y_1 = x_1 + x_2 + x_3$, $y_2 = x_4 + x_5 + x_6$;

$$\frac{8x_1 + 20x_2 + 4x_3}{x_1 + x_2 + x_3} \leq 7$$

$$\frac{83x_1 + 109x_2 + 74x_3}{x_1 + x_2 + x_3} \geq 80$$

$$\left.\begin{array}{l} 0 \leq x_1 + x_4 \leq 2700 \\ 0 \leq x_2 + x_5 \leq 1350 \\ 0 \leq x_3 + x_6 \leq 4100 \end{array}\right\} \text{\# of barels}$$

$$\frac{8x_4 + 20x_5 + 4x_6}{x_4 + x_5 + x_6} \leq 6$$

$$\frac{83x_4 + 109x_5 + 74x_6}{x_4 + x_5 + x_6} \geq 100$$

$$x_1, x_2, \ldots, x_6, y_1, y_2 \geq 0$$

16 Let x_A, x_B, x_C, x_D be tons of cargo A, B, C, D

let w_{Ab}, w_{Bb}, w_{Cb}, w_{Db} be cargo weights in back compartment

w_{Af}, w_{Bf}, w_{Cf}, w_{Df} " " front "

w_{AC}, w_{BC}, w_{CC}, w_{DC} " " center "

Max. $220x_A + 280x_B + 250x_C + 200x_D$

Subject to: $x_A = w_{Ab} + w_{Af} + w_{AC}$

$x_B = w_{Bb} + w_{Bf} + w_{BC}$

$x_C = w_{Cb} + w_{Cf} + w_{CC}$

$x_D = w_{Db} + w_{Df} + w_{DC}$

$w_{Ab} + w_{Bb} + w_{Cb} + w_{Db} \leq 100$

$w_{Af} + w_{Bf} + w_{Cf} + w_{Df} \leq 120$

$w_{AC} + w_{BC} + w_{CC} + w_{DC} \leq 180$

$$\frac{500w_{Ab}}{20} + \frac{700w_{Bb}}{16} + \frac{600w_{Cb}}{25} + \frac{400w_{Db}}{13} \leq 5000$$

$$\frac{500w_{Af}}{20} + \frac{700w_{Bf}}{16} + \frac{600w_{Cf}}{25} + \frac{400w_{Df}}{13} \leq 7000$$

$$\frac{500w_{AC}}{20} + \frac{700w_{BC}}{16} + \frac{600w_{CC}}{25} + \frac{400w_{DC}}{13} \leq 9000$$

$$\frac{\sum_i w_{ib}}{x_A + x_B + x_C + x_D} = \frac{100}{400}$$

$$\frac{\sum_i w_{if}}{x_A + x_B + x_C + x_D} = \frac{120}{400}$$

$$\frac{\sum_i w_{ic}}{x_A + x_B + x_C + x_D} = \frac{180}{400}$$

$x_A, x_B, x_C, x_D \geq 0$