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COMPUTER ENGINEERING
(OF 512).

1) Linear Programming is an application that enables determining the best or optimal outcome for a set of parameters. It applies matrix algebra and was the first method widely used for optimization using digital computation. A linear programming involves many variables and equations that is ultimately used to achieve the best outcome (such as maximum profit or lowest cost) in a mathematical model.

Applications:

① Air transportation: This mathematical model will be used to schedule its flights to maximize or minimize or route to achieve its certain airgoal goal maximum;
② Aviation and Environment: Its used to achieve optimal control to obtain the most induced aircraft environmentally friendly trajectory. It increases airlines efficiency and decreases expenses.

③ Manufacturing

It enables efficient manufacturing as a manufacturer can use linear Programming to make a linear expression of

how much raw materials to be used. This is to ensure project is maximized based on the raw materials and the time needed.

④ Energy Industry

It used in order to optimize electric load requirements generators, transmission and distribution lines. Linear Programming provides a method to optimize the electric power system design and allows for matching the electric load in the shortest total distance hence providing a valuable tool to the energy industry.

⑤ Shape Optimization (in Aerodynamics)

In airfoil meshing, it allows for the reduction of the drag coefficient for the airfoil. Constraints may include lift coefficient, relative maximum thickness, nose radius and trailing edge angle. Shape optimization seeks to make a shock free airfoil with a feasible shape. Hence, it provides engineers with an essential tool in shape optimization.

⑥ Nutrition

It provides a tool that aids in planning for dietary needs in order to provide healthy, low-cost food baskets.

Nutritionists make use of this model to calculate the

foods needed to provide nutrition at low cost in order
to prevent non communicable disease.

? Contribution Margin of printer and keyboard.

$$W = 30x_1 + 20x_2$$

$$2x_1 + 3x_2 \leq 1000$$

$$x_1 + x_2 \leq 800$$

where $x_1 \geq 0, x_2 \geq 0$

Applying Simplex Method

R_1	2	1	1	0	1000	$S_1 = 500$
R_2	1	1	0	1	800	$S_2 = 800$
R_3	-30	-20	0	0	0	

↑

dividing R_1 through by 2

	x_1	x_2	S_1	S_2	b	
R_1	1	$\frac{1}{2}$	$\frac{1}{2}$	0	500	S_1
R_2	1	1	0	1	800	S_2
R_3	-30	-20	0	0	0	

$$-R_1 + R_2 \rightarrow R_2$$

$$50R_1 + R_2 \rightarrow R_3$$

	x_1	x_2	s_1	s_2	
R_1	1	$\frac{1}{2}$	$\frac{1}{2}$	0	500
R_2	0	$\frac{1}{2}$	$\frac{1}{2}$	1	800
R_3	0	-5	15	0	1500

↑

	x_1	x_2	s_1	s_2	b
R_1	1	$\frac{1}{2}$	$\frac{1}{2}$	0	500
R_2	0	1	1	2	600
R_3	0	-5	15	0	1500

$$-\frac{1}{2}R_2 + R_1 \rightarrow R_1$$

$$5R_2 + R_3 \rightarrow R_3$$

	x_1	x_2	s_1	s_2	b
R_1	1	0	0	-1	200
R_2	0	1	1	2	600
R_3	0	0	20	10	1800

From the simplex tableau, it's identified that the max value is 1800 hours

Hence, in
Therefore, to maximize contribution margin, total working hours = 1800
 $x_1 = 20, x_2 = 10$