SECOND ATTEMPT

THE PROBLEM THEN IS TO ELIMINATE k_j FROM THE COST IF THE CORRESPONDING $x_j = 0$.

THE ONLY WAY TO DO THIS IS TO INCORPORATE A FLAG (INDICATOR) VARIABLE WHICH INDICATES WHETHER A PARTICULAR DESIGN IS BEING USED.

FOR EXAMPLE:

LET $$y_j^i = \begin{cases} 1 & \text{if } x_j^i > 0 \\ 0 & \text{if } x_j^i = 0 \end{cases}$$

THEN
$$Z = \sum_{\forall i} \sum_{\forall j} k_j y_j^i + c_j x_j^i$$

THEN FOR THE EXAMPLE WHERE $x_2^1 > 0$ AND $x_3^2 > 0$
$$Z = k_2 + c_2 x_2^1 + k_3 + c_3 x_3^2$$

THIS IS OKAY. HOWEVER, HOW DO WE ENSURE THAT
$$y_j^i = \begin{cases} 1 & x_j^i > 0 \\ 0 & x_j^i = 0 \end{cases}$$

WE NEED TO DO THIS WITH CONSTRAINTS

$$x_j^i \le M y_j^i \qquad \text{[M IS A LARGE NUMBER]}$$

AND $y_j^i = 0$ or 1 ← 0-1 INTEGER VARIABL

WHEN $x_j^i > 0$ THEN y_j^i MUST BE EQUAL TO 1 FOR THE INEQUATION (CONSTRAINT) TO BE SATISFIED.

$x_j^i = 0$ THEN y_j^i CAN BE 0 OR 1
BUT SINCE $y_j^i = 0$ IS MORE BENEFICIAL FROM MINIMIZING Z STANDPOINT $y_j^i = 0$ WHENEVER IT CAN BE 0 OR 1.
HENCE WHEN $x_j^i = 0$, $y_j^i = 0$.

HENCE AN INTEGER VARIABLE HAD TO BE INTRODUCED TO REPRESENT THE "FIXED COST" COST STRUCTURE OF THE PROBLEM