(The Clerk of Convenience Store) During each four-hour period, the clerk force requires the following number of on-duty working hours: four from midnight to 4 a.m.; four from 4 a.m. to 8 a.m.; seven from 8 a.m. to noon; seven from noon to 4 p.m.; eight from 4 p.m. to 8 p.m.; and ten from 8 p.m. to midnight. Each clerk works two consecutive four-hour shifts. Determine how to minimize the number of clerks needed to meet Convenience Store’s daily requirements.

**Discussion: -**

Our Objective is to develop an LP model that relates six shift schedules to daily number of clerks available, and to use Solver on this model to find a schedule that uses the fewest number of clerks and meets all daily workforce requirements.

Our objective is to minimize the total number of clerks. By looking at the problem, we understand that we need to schedule clerks for six shifts. In the problem, we can see that there is a condition that a clerk who starts work will continue doing two continuous shifts. Assume if you know the clerks starting their work in particular shift, will you be able to solve the problem? Yes, we can solve the problem. Now please look at the picture given, we have decided our decision variable, now we need to calculate the clerks who started their work in previous shift also will continue doing their job in this shift. We have solved similar problem earlier by creating information table which helps us in finding this value. Please check mathematical model for information table.

**Mathematical Model: -**

*Parameters (Inputs):*

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Information Table** | 12 AM to 4 AM | 4 AM to 8 AM | 8 AM to 12 PM | 12 PM to 4 PM | 4 PM to 8 PM | 8 PM to 12 AM |
| 12 AM to 4 AM | 1 | 1 | 0 | 0 | 0 | 0 |
| 4 AM to 8 AM | 0 | 1 | 1 | 0 | 0 | 0 |
| 8 AM to 12 PM | 0 | 0 | 1 | 1 | 0 | 0 |
| 12 PM to 4 PM | 0 | 0 | 0 | 1 | 1 | 0 |
| 4 PM to 8 PM | 0 | 0 | 0 | 0 | 1 | 1 |
| 8 PM to 12 AM | 1 | 0 | 0 | 0 | 0 | 1 |

*Decision Variables:*

*Calculated Variables:*

*Objective:*

*Constraints:*

As it is minimizing the number of clerks, we must make sure that we give non-negative constraint to the decision variable. Number of clerks available in shift ‘j’ should be always greater than the on-duty clerks demand which is given in our problem.

*Excel Implementation:*

Please find the attached spreadsheet for solution.



