KSRTC BUS SCHEDULING

Problem

To create a bus scheduling system from the given input by considering several constraints.

Constraints

- 1. Hours of work:
 - a) Steering Duty
 - b) Sign on & Sign off time (30 minutes(15+15))
 - c) Short breaks taken in each terminals (Under 15 minutes)
- 2. Compulsory 30 minutes break after 5 hours of continuous work.
- 3. In each schedule, There shouldn't be more than of 10 Hours of Work and 12 Hours of Spread over.
- 4. Working hours of more than 8 is considered as Overtime and will be charged double of the payment.
- > Minimize Overtime, Spill over,
- > Hours of work maximum 10 hour, compulsory 8 hours of steering duty.
- > Maximum 12 hours spill over.
- > Max 5 hours duty in single stretch(30 minutes compulsory break with payment)
- > Ending time Starting time + 30 minutes(break) = steering duty.
- > Breaks which goes beyond 30 minutes is not payed(eg. If 35 minutes, no payment for that 5 minutes).
- In rare cases we can take a split of upto 15 minutes(To adjust the duty). But this split should occur only at most 1 time in a schedule(trip).

TASKS PERFORMED

1. Importing xlsx file into a dataframe

```
import pandas as pd
  data = pd.read_excel(r"input.xlsx")
  df = pd.DataFrame(data)
  #Renaming coloumns
  df.rename(columns={'Unnamed: 0': 'S1 No.',
                       'Unnamed: 1': 'Departure Time',
                       'Unnamed: 2': 'Departure Place',
                       'Unnamed: 3': 'Route of Operation',
                       'Unnamed: 4': 'Arrival Place',
                       'Unnamed: 5': 'Arrival Time act',
                       'Unnamed: 6': 'KM',
                       'Unnamed: 7': 'Running Time'}, inplace=True)
  df.drop(index=0, inplace=True)
  df.reset_index(drop=True, inplace=True)
  #Dropping coloumns 'Duplicates' & 'Remarks'
  df = df.drop(columns=['Unnamed: 8', 'Unnamed: 9'])
  display(df)
√ 7.1s
     SI No. Departure Time Departure Place
                                                Route of Operation
                                                                    Arrival Place Arrival Time act
                                                                                                   KM
                                                                                                        Running Time
 0
                    03:40:00
                                         PSL
                                                                           KLKV
                                                                                         03:45:00
                                                                                                    3.5
                                                                                                              00:05:00
                                                               NH
                    07:55:00
                                                                           KLKV
                                                                                         08:05:00
                                                                                                    3.5
                                                                                                              00:10:00
 2
         3
                    06:40:00
                                         PSL
                                                               NH
                                                                           KLKV
                                                                                         06:50:00
                                                                                                    3.5
                                                                                                              00:10:00
                    04:30:00
                                         PSL
                                                                                                              00:10:00
         4
                                                               NH
                                                                           KLKV
                                                                                         04:40:00
                                                                                                              00:10:00
 4
                    12:45:00
                                         PSL
                                                               NH
                                                                           KLKV
                                                                                         12:55:00
                                                                                                    3.5
       723
                    20:40:00
                                        TVM
                                                          NH-KLKV
                                                                             PSL
                                                                                                 37.2
                                                                                                              01:30:00
                                                                                         22:10:00
                                              KTNI-KDPM-TVM-NTA
723
       724
                    08:15:00
                                                                                                              02:20:00
                                        PCD
                                                                           KLKV
                                                                                         10:35:00
                    10:45:00
                                                                           VLRD
                                                                                                    17
                                                                                                              00:45:00
724
       725
                                        KLKV
                                                             KRKM
                                                                                         11:30:00
725
       726
                    11:40:00
                                       VLRD
                                                       KRKM-KLKV
                                                                             PSL
                                                                                         12:30:00 20.5
                                                                                                              00:50:00
```

Imported the xlsx file and made some changes such as renaming the columns and resetting the index, as it started from 1 not 0. Deleted the extra columns 'Duplicates' and 'Remarks'.

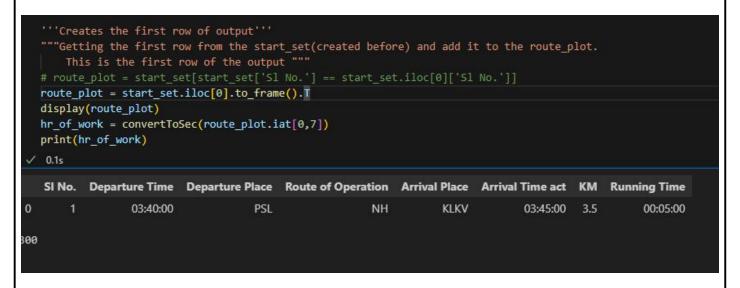
2. Sorting the data set with respect to the departure place and time.

#Sorting the routes starting from PSL with respect to their departure time in ascending order(creating new sorted set) sorted_set = df.sort_values('Departure Time', ascending=True) start_set = sorted_set[sorted_set['Departure Place'] == 'PSL'] display(start_set) ✓ 0.0s								
	SI No.	Departure Time	Departure Place	Route of Operation	Arrival Place	Arrival Time act	КМ	Running Time
0	1	03:40:00	PSL	NH	KLKV	03:45:00	3.5	00:05:00
14	15	04:20:00	PSL	NH	KLKV	04:25:00	3.5	00:05:00
3	4	04:30:00	PSL	NH	KLKV	04:40:00	3.5	00:10:00
692	693	05:00:00	PSL	MKD-KLD-PLKDA-NTA-TVM-MC-SKRM-CHPY	PCD	07:45:00	66.5	02:45:00
644	645	05:00:00	PSL	KRKM-MJ	TVM	06:35:00	39	01:35:00

61	62	14:35:00	PSL	NH	KLKV	14:45:00	3.5	00:10:00
62	63	14:40:00	PSL	NH	KLKV	14:50:00	3.5	00:10:00
54	55	15:05:00	PSL	NH	KLKV	15:15:00	3.5	00:10:00
64	65	15:20:00	PSL	NH	KLKV	15:30:00	3.5	00:10:00
530 104 ro	531 ws × 8 co	15:40:00 olumns	PSL	KRKM	VLRD	16:20:00	17	00:40:00

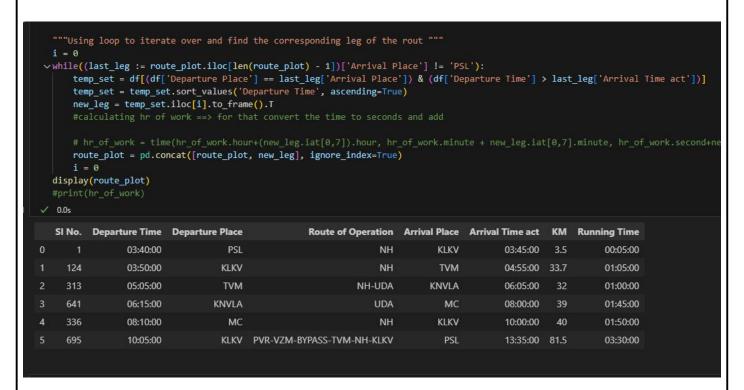
Created a new dataset having only departure place as PSL and sorted it according to its time in ascending order.

3. Retrieving the first leg from the sorted set



Got the first route of operation from the sorted set by setting the index as 0.

4. Making the first schedule without considering the constraints.



Made the first schedule from the datasheet without considering any constraints. Set departure place and last arrival place as PSL. Using a while loop, found the next legs whose departure place is same as of last leg's arrival place and departure time is greater than last leg's arrival time.