

Question 4: Route Filtering

```
[1, 2, 3, 4, 5, 6, 7, 8, 9, 10]
```

Question 5: Matrix Value Modification

```
id_2  801  802  803  804  805  806  807  808  809  821  822  823  \
id_1
801    0.0   3.5   7.5   9.6  14.6  16.8  21.1  24.5  15.8  17.6  18.5  19.9
802    3.5   0.0   4.2   6.5  11.5  13.6  17.9  21.4  23.1  15.7  16.6  17.9
803    7.5   4.2   0.0   2.5   7.5   9.6  13.9  17.4  19.1  22.2  23.6  15.5
804    9.6   6.5   2.5   0.0   5.5   7.6  11.9  15.4  17.1  20.2  21.6  23.9
805   14.6  11.5   7.5   5.5   0.0   2.5   6.8  10.2  12.0  15.0  16.5  18.8
806   16.8  13.6   9.6   7.6   2.5   0.0   4.8   8.2  10.0  13.0  14.5  16.8
807   21.1  17.9  13.9  11.9   6.8   4.8   0.0   3.6   5.4   8.5  10.0  12.3
808   24.5  21.4  17.4  15.4  10.2   8.2   3.6   0.0   2.1   5.2   6.6   8.9
809   15.8  23.1  19.1  17.1  12.0  10.0   5.4   2.1   0.0   3.6   5.1   7.4
821   17.6  15.7  22.2  20.2  15.0  13.0   8.5   5.2   3.6   0.0   2.2   4.6
822   18.5  16.6  23.6  21.6  16.5  14.5  10.0   6.6   5.1   2.2   0.0   2.8
823   19.9  17.9  15.5  23.9  18.8  16.8  12.3   8.9   7.4   4.6   2.8   0.0
824   20.9  19.0  16.6  15.4  20.5   9.8  14.0  10.6   9.2   6.3   4.5   2.2
825   21.8  19.9  17.5  16.3  22.0  20.0  15.5  12.1  10.6   7.8   5.9   3.7
826   23.2  21.2  18.8  17.6  24.2  22.2  17.7  14.3  12.8  10.0   8.2   5.9
827   24.4  22.4  20.0  18.8  15.8  24.3  19.8  16.4  14.9  11.8  10.0   7.7
829   27.2  25.3  22.9  21.7  18.6  17.4  24.5  21.2  19.7  16.6  14.8  12.5
830   28.7  26.8  24.4  23.2  20.1  18.9  16.2  23.6  22.1  19.0  17.2  14.9
831   29.4  27.5  25.1  23.9  20.8  19.6  16.9  24.8  23.3  20.2  18.4  16.1

id_2  824  825  826  827  829  830  831
id_1
801   20.9  21.8  23.2  24.4  27.2  28.7  29.4
802   19.0  19.9  21.2  22.4  25.3  26.8  27.5
803   16.6  17.5  18.8  20.0  22.9  24.4  25.1
804   15.4  16.3  17.6  18.8  21.7  23.2  23.9
805   20.5  22.0  24.2  15.8  18.6  20.1  20.8
806   18.5  20.0  22.2  24.3  17.4  18.9  19.6
807   14.0  15.5  17.7  19.8  24.5  16.2  16.9
808   10.6  12.1  14.3  16.4  21.2  23.6  24.8
809    9.2  10.6  12.8  14.9  19.7  22.1  23.3
821    6.3    7.8  10.0  11.8  16.6  19.0  20.2
822    4.5    5.9   8.2  10.0  14.8  17.2  18.4
823    2.2    3.7   5.9   7.7  12.5  14.9  16.1
824    0.0    2.1   4.4   6.2  11.0  13.3  14.6
825    2.1    0.0   2.8   4.6   9.3  11.7  12.9
826    4.4    2.8   0.0   2.6   7.3   9.6  10.9
827    6.2    4.6   2.6   0.0   5.2   7.6   8.8
829   16.0    9.3   7.3   5.2   0.0   3.0   4.2
830   13.3    0.0   9.6   7.6   3.0   0.0   1.7
831   14.6   12.9  10.9   8.8   4.2   1.7   0.0
```

Question 6: Time Check

```
<ipython-input-6-a1722196477c>:15: FutureWarning: Indexing with multiple keys (implicitly converted to a tuple of keys) will be deprecated in a future version.
result_series = df.groupby(['id', 'id_2'])['start_timestamp', 'end_timestamp'].apply(lambda x: any(mask.loc[x.index]))

   id  id_2  0
0  1014000  -1  True
1  1014002  -1  True
2  1014003  -1  True
3  1030000  -1  True
4  1030000  1030002  True
...     ...  ...  ...
9249  1330016  1330006  True
9250  1330016  1330008  True
9251  1330016  1330010  True
9252  1330016  1330012  True
9253  1330016  1330014  True

[9254 rows x 3 columns]
```

