Python_task2

Question 1 : Distance Matrix Calculation

```
           1001400  1001402  1001404  1001406  1001408  1001410  1001412  \
1001400       0.0      9.7     29.9     45.9     67.6     78.7     94.3
1001402       9.7      0.0     20.2     36.2     57.9     69.0     84.6
1001404      29.9     20.2      0.0     16.0     37.7     48.8     64.4
1001406      45.9     36.2     16.0      0.0     21.7     32.8     48.4
1001408      67.6     57.9     37.7     21.7      0.0     11.1     26.7
1001410      78.7     69.0     48.8     32.8     11.1      0.0     15.6
1001412      94.3     84.6     64.4     48.4     26.7     15.6      0.0
1001414     112.5    102.8     82.6     66.6     44.9     33.8     18.2
1001416     125.7    116.0     95.8     79.8     58.1     47.0     31.4
1001418     139.3    129.6    109.4     93.4     71.7     60.6     45.0
1001420     152.2    142.5    122.3    106.3     84.6     73.5     57.9
1001422     161.8    152.1    131.9    115.9     94.2     83.1     67.5
1001424     173.2    163.5    143.3    127.3    105.6     94.5     78.9
1001426     191.8    182.1    161.9    145.9    124.2    113.1     97.5
1001428     207.6    197.9    177.7    161.7    140.0    128.9    113.3
1001430     216.2    206.5    186.3    170.3    148.6    137.5    121.9
1001432     225.2    215.5    195.3    179.3    157.6    146.5    130.9
1001434     233.1    223.4    203.2    187.2    165.5    154.4    138.8
1001436     237.1    227.4    207.2    191.2    169.5    158.4    142.8
1001437     242.1    232.4    212.2    196.2    174.5    163.4    147.8
1001438     246.1    236.4    216.2    200.2    178.5    167.4    151.8
1001440     256.1    246.4    226.2    210.2    188.5    177.4    161.8
1001442     260.0    250.3    230.1    214.1    192.4    181.3    165.7
1001444     273.2    263.5    243.3    227.3    205.6    194.5    178.9
1001446     279.8    270.1    249.9    233.9    212.2    201.1    185.5
1001448     289.4    279.7    259.5    243.5    221.8    210.7    195.1
1001450     305.1    295.4    275.2    259.2    237.5    226.4    210.8
1001452     315.0    305.3    285.1    269.1    247.4    236.3    220.7
1001454     326.3    316.6    296.4    280.4    258.7    247.6    232.0
1001456     339.9    330.2    310.0    294.0    272.3    261.2    245.6
1001458     348.8    339.1    318.9    302.9    281.2    270.1    254.5
1001460     353.9    344.2    324.0    308.0    286.3    275.2    259.6
1001461     366.7    357.0    336.8    320.8    299.1    288.0    272.4
1001462     371.8    362.1    341.9    325.9    304.2    293.1    277.5
1001464     398.5    388.8    368.6    352.6    330.9    319.8    304.2
1001466     407.0    397.3    377.1    361.1    339.4    328.3    312.7
1001468     417.7    408.0    387.8    371.8    350.1    339.0    323.4
1001470     428.3    418.6    398.4    382.4    360.7    349.6    334.0
1001472     444.3    434.6    414.4    398.4    376.7    365.6    350.0
1001488     264.5    254.8    234.6    218.6    196.9    185.8    170.2
1004354     270.5    260.8    240.6    224.6    202.9    191.8    176.2
1004355     272.5    262.8    242.6    226.6    204.9    193.8    178.2
1004356     268.5    258.8    238.6    222.6    200.9    189.8    174.2

           1001414  1001416  1001418  ...  1001462  1001464  1001466  1001468  \
1001400     112.5    125.7    139.3  ...    371.8    398.5    407.0    417.7
1001402     102.8    116.0    129.6  ...    362.1    388.8    397.3    408.0
1001404      82.6     95.8    109.4  ...    341.9    368.6    377.1    387.8
1001406      66.6     79.8     93.4  ...    325.9    352.6    361.1    371.8
1001408      44.9     58.1     71.7  ...    304.2    330.9    339.4    350.1
1001410      33.8     47.0     60.6  ...    293.1    319.8    328.3    339.0
1001412      18.2     31.4     45.0  ...    277.5    304.2    312.7    323.4
1001414       0.0     13.2     26.8  ...    259.3    286.0    294.5    305.2
1001416      13.2      0.0     13.6  ...    246.1    272.8    281.3    292.0
1001418      26.8     13.6      0.0  ...    232.5    259.2    267.7    278.4
1001420      39.7     26.5     12.9  ...    219.6    246.3    254.8    265.5
1001422      49.3     36.1     22.5  ...    210.0    236.7    245.2    255.9
```

Question 2: Unroll Distance Matrix

```
       id_start    id_end  distance
0      1001400   1001402       9.7
1      1001400   1001404      29.9
2      1001400   1001406      45.9
3      1001400   1001408      67.6
4      1001400   1001410      78.7
...        ...       ...       ...
1801   1004356   1001470     159.8
1802   1004356   1001472     175.8
1803   1004356   1001488       4.0
```

```
1804    1004356    1004354         2.0
1805    1004356    1004355         4.0

[1806 rows x 3 columns]
```

Question 3: Finding IDs within Percentage Threshold

```
[1001402, 1001404, 1001406, 1001408, 1001410, 1001412, 1001414, 1001416, 1001418, 1001420, 1001422, 1001424, 1001426, 1001428, 10014
```

Question 4: Calculate Toll Rate

```
       id_start    id_end  distance    moto      car       rv       bus    truck
0       1001400   1001402       9.7    7.76    11.64    14.55    21.34    34.92
1       1001400   1001404      29.9   23.92    35.88    44.85    65.78   107.64
2       1001400   1001406      45.9   36.72    55.08    68.85   100.98   165.24
3       1001400   1001408      67.6   54.08    81.12   101.40   148.72   243.36
4       1001400   1001410      78.7   62.96    94.44   118.05   173.14   283.32
...         ...       ...       ...     ...      ...      ...      ...      ...
1801    1004356   1001470     159.8  127.84   191.76   239.70   351.56   575.28
1802    1004356   1001472     175.8  140.64   210.96   263.70   386.76   632.88
1803    1004356   1001488       4.0    3.20     4.80     6.00     8.80    14.40
1804    1004356   1004354       2.0    1.60     2.40     3.00     4.40     7.20
1805    1004356   1004355       4.0    3.20     4.80     6.00     8.80    14.40

[1806 rows x 8 columns]
```

Question 5: Calculate Time-Based Toll Rates