```
In [168]:  import pandas as pd

           from preprocessing import get_state_data, get_daily_cases_data, remove_outl

           covid_cases_data_path = './dataset/United_States_COVID-19_Cases_and_Deaths_

           ct_state_cases_data, fl_state_cases_data = get_state_data(filename=covid_ca
                                                                     states=['CT',
                                                                     location_col_
                                                                     cols=['submis
                                                                           'tot_ca
                                                                           'new_ca

           ct_daily_cases_data = get_daily_cases_data(ct_state_cases_data, location_co
                                                      date_col_name='submission_da
                                                      non_cumulative_cols=['new_ca
                                                      set_zero_for_negatives=True)
           fl_daily_cases_data = get_daily_cases_data(fl_state_cases_data, location_co
                                                      date_col_name='submission_da
                                                      non_cumulative_cols=['new_ca
                                                      set_zero_for_negatives=True)
```

```
State: CT rows with missing values: 0
State: FL rows with missing values: 0
2 negative values in daily data for col tot_cases
19 negative values in daily data for col tot_death
0 negative values in daily data for col tot_cases
0 negative values in daily data for col tot_death

/Users/mayankmanuja/work/cse544-project/preprocessing.py:63: SettingWithC
opyWarning:
A value is trying to be set on a copy of a slice from a DataFrame

See the caveats in the documentation: https://pandas.pydata.org/pandas-do
cs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy (http
s://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returni
ng-a-view-versus-a-copy)
  daily_data_df[col][daily_data_df[col] < 0] = 0
```

```
In [169]:  import scipy.special
           import scipy.stats as stats
           import matplotlib.pyplot as plt
           import numpy as np
```

In [170]:
```python
#Conneticut analysis

# Week 1-4
ct_daily_cases_data['daily_stats'] = ct_daily_cases_data['tot_cases'] + ct_
four_week_data = ct_daily_cases_data[ct_daily_cases_data['submission_date']
four_week_data = four_week_data[four_week_data['submission_date'] < '2020-0
beta = 1/four_week_data['daily_stats'].mean()
x = np.linspace(0, 250, 250)
y1 = stats.gamma.pdf(x, a=1, scale=1/beta)

# Week 5
fifth_week_data = ct_daily_cases_data[ct_daily_cases_data['submission_date'
fifth_week_data = fifth_week_data[fifth_week_data['submission_date'] < '202
alpha_1 = 1 + fifth_week_data['daily_stats'].sum()
beta_1 = beta + len(fifth_week_data)
y2 = stats.gamma.pdf(x, a=alpha_1, scale=1/beta_1)

# Week 6
sixth_week_data = ct_daily_cases_data[ct_daily_cases_data['submission_date'
sixth_week_data = sixth_week_data[sixth_week_data['submission_date'] < '202
alpha_2 = alpha_1 + sixth_week_data['daily_stats'].sum()
beta_2 = beta_1 + len(sixth_week_data)
y3 = stats.gamma.pdf(x, a=alpha_2, scale=1/beta_2)

# Week 7
seventh_week_data = ct_daily_cases_data[ct_daily_cases_data['submission_dat
seventh_week_data = seventh_week_data[seventh_week_data['submission_date']
alpha_3 = alpha_2 + seventh_week_data['daily_stats'].sum()
beta_3 = beta_2 + len(seventh_week_data)
y4 = stats.gamma.pdf(x, a=alpha_3, scale=1/beta_3)

# Week 8
eightht_week_data = ct_daily_cases_data[ct_daily_cases_data['submission_dat
eightht_week_data = eightht_week_data[eightht_week_data['submission_date']
alpha_4 = alpha_3 + eightht_week_data['daily_stats'].sum()
beta_4 = beta_3 + len(eightht_week_data)
y5 = stats.gamma.pdf(x, a=alpha_4, scale=1/beta_4)
```

In [171]:
```python
from matplotlib.pyplot import figure
figure(figsize=(10, 3), dpi=80)
plt.plot(x, y1, label='Prior - Exponiential distribution')
plt.plot(x, y2, label='Posterior after week-5 (Gamma distribution)')
plt.plot(x, y3, label='Posterior after week-6 (Gamma distribution)')
plt.plot(x, y4, label='Posterior after week-7 (Gamma distribution)')
plt.plot(x, y5, label='Posterior after week-8 (Gamma distribution)')
plt.xlabel('Covid Cases')
plt.ylabel('Pmf')

# displaying the title
plt.title("Posterior distributions for Conneticut covid cases")
plt.legend()
plt.show()
y2 = y2.tolist()
max_index = y2.index(max(y2))
print("MAP for posterior after week 5:", max_index)

y3 = y3.tolist()
max_index = y3.index(max(y3))
print("MAP for posterior after week 6:", max_index)

y4 = y4.tolist()
max_index = y4.index(max(y4))
print("MAP for posterior after week 7:", max_index)

y5 = y5.tolist()
max_index = y5.index(max(y5))
print("MAP for posterior after week 8:", max_index)
```
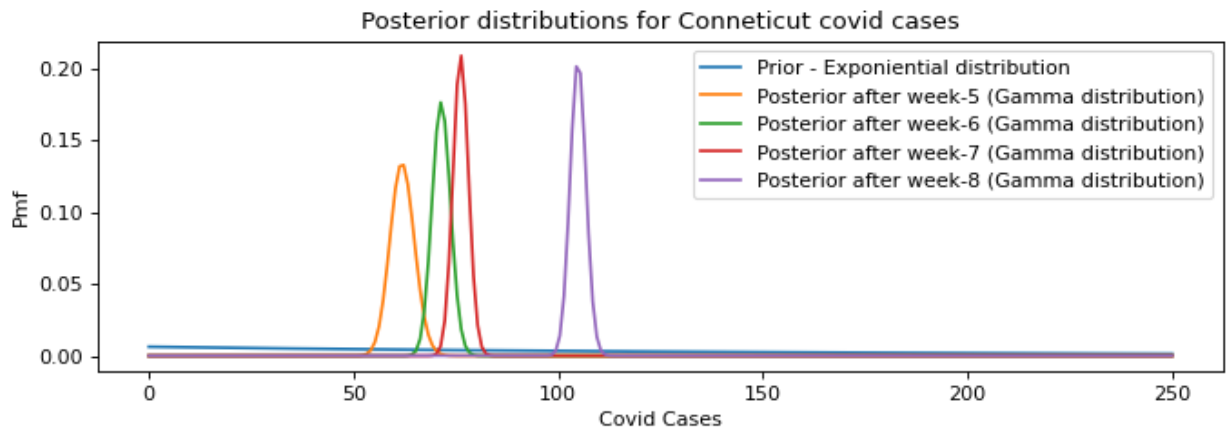

Posterior distributions for Conneticut covid cases

```
MAP for posterior after week 5: 62
MAP for posterior after week 6: 71
MAP for posterior after week 7: 76
MAP for posterior after week 8: 104
```

In [ ]:

In [172]:

```python
#Florida analysis

# Week 1-4
fl_daily_cases_data['daily_stats'] = fl_daily_cases_data['tot_cases'] + fl_
four_week_data = fl_daily_cases_data[fl_daily_cases_data['submission_date']
four_week_data = four_week_data[four_week_data['submission_date'] < '2020-0
beta = 1/four_week_data['daily_stats'].mean()
x = np.linspace(8000, 11000, 11000)
y1 = stats.gamma.pdf(x, a=1, scale=1/beta)

# Week 5
fifth_week_data = fl_daily_cases_data[fl_daily_cases_data['submission_date'
fifth_week_data = fifth_week_data[fifth_week_data['submission_date'] < '202
alpha_1 = 1 + fifth_week_data['daily_stats'].sum()
beta_1 = beta + len(fifth_week_data)
y2 = stats.gamma.pdf(x, a=alpha_1, scale=1/beta_1)

# Week 6
sixth_week_data = fl_daily_cases_data[fl_daily_cases_data['submission_date'
sixth_week_data = sixth_week_data[sixth_week_data['submission_date'] < '202
alpha_2 = alpha_1 + sixth_week_data['daily_stats'].sum()
beta_2 = beta_1 + len(sixth_week_data)
y3 = stats.gamma.pdf(x, a=alpha_2, scale=1/beta_2)

# Week 7
seventh_week_data = fl_daily_cases_data[fl_daily_cases_data['submission_dat
seventh_week_data = seventh_week_data[seventh_week_data['submission_date']
alpha_3 = alpha_2 + seventh_week_data['daily_stats'].sum()
beta_3 = beta_2 + len(seventh_week_data)
y4 = stats.gamma.pdf(x, a=alpha_3, scale=1/beta_3)

# Week 8
eightht_week_data = fl_daily_cases_data[fl_daily_cases_data['submission_dat
eightht_week_data = eightht_week_data[eightht_week_data['submission_date']
alpha_4 = alpha_3 + eightht_week_data['daily_stats'].sum()
beta_4 = beta_3 + len(eightht_week_data)
y5 = stats.gamma.pdf(x, a=alpha_4, scale=1/beta_4)
```

```python
In [173]: from matplotlib.pyplot import figure
          figure(figsize=(10, 3), dpi=80)
          plt.plot(x, y1, label='Prior - Exponiential distribution')
          plt.plot(x, y2, label='Posterior after week-5 (Gamma distribution)')
          plt.plot(x, y3, label='Posterior after week-6 (Gamma distribution)')
          plt.plot(x, y4, label='Posterior after week-7 (Gamma distribution)')
          plt.plot(x, y5, label='Posterior after week-8 (Gamma distribution)')
          plt.xlabel('Covid Cases')
          plt.ylabel('Pmf')

          # displaying the title
          plt.title("Posterior distributions for Florida covid cases")
          plt.legend()
          plt.show()
          y2 = y2.tolist()
          max_index = y2.index(max(y2))
          print("MAP for posterior after week 5:", max_index)

          y3 = y3.tolist()
          max_index = y3.index(max(y3))
          print("MAP for posterior after week 6:", max_index)

          y4 = y4.tolist()
          max_index = y4.index(max(y4))
          print("MAP for posterior after week 7:", max_index)

          y5 = y5.tolist()
          max_index = y5.index(max(y5))
          print("MAP for posterior after week 8:", max_index)
```
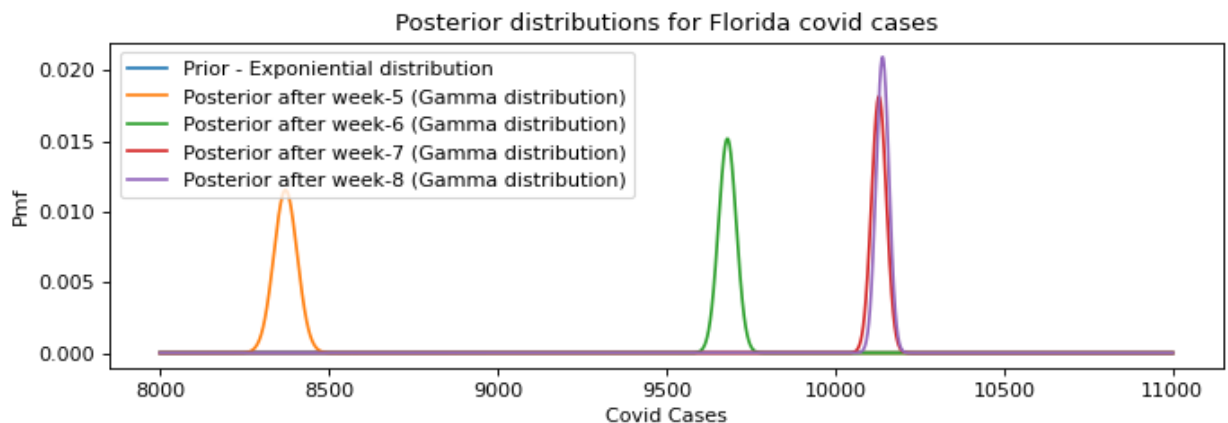

Posterior distributions for Florida covid cases

```
MAP for posterior after week 5: 1363
MAP for posterior after week 6: 6163
MAP for posterior after week 7: 7809
MAP for posterior after week 8: 7848
```

```
In [ ]:
```