ASSIGNMENT 8.1

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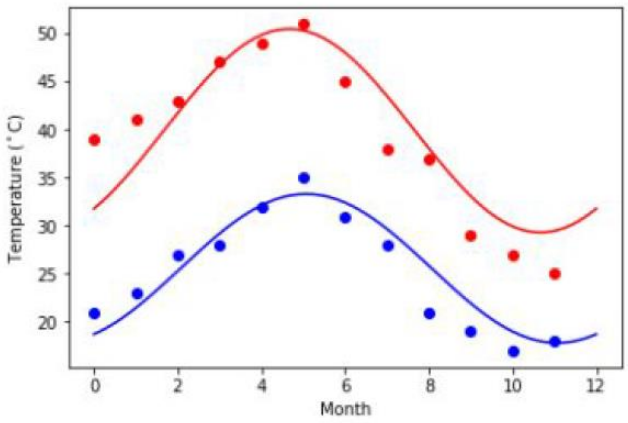
1. Introduction

This assignment will help you to consolidate the concepts learnt in the session.

2. Problem Statement

We have the min and max temperatures in a city In India for each months of the year. We would like to find a function to describe this and show it graphically, the dataset given below.
Task:
1. fitting it to the periodic function
2. plot the fit
Data
Max = 39, 41, 43, 47, 49, 51, 45, 38, 37, 29, 27, 25
Min = 21, 23, 27, 28, 32, 35, 31, 28, 21, 19, 17, 18

3. Expected Output



Solution

Assignment 8.1

ACD MDS Mar 2018 batch - Student: K. Anandaranga

In [8]:
```
# Plot the best fit curve to the min and max temp provided
import numpy as np
from scipy import optimize
import matplotlib.pyplot as plt

temp_max = np.array ([39, 41, 43, 47, 49, 51, 45, 38, 37, 29, 27, 25])
temp_min = np.array ([21, 23, 27, 28, 32, 35, 31, 28, 21, 19, 17, 18])
months = np.arange(1,13,1) # Array of months from 1 to 12

# The model for the monthly averages is y = A*2π*cos((x + b)/max(x)) + a
# Here, x represents each month, where 1= Jan, 12 = Dec

def monthly_temps (x, a, A, b):  # function that returns temp for given parameters
    return (A*np.cos((x +b)*2* np.pi/x.max()) + a)

# Now fit the best fit curve by using the given trignometric eq
res_max, cov_max = optimize.curve_fit (monthly_temps, months, temp_max)
res_min, cov_min = optimize.curve_fit (monthly_temps, months, temp_min)
print (" -------- Max Temp curve fit parameters a, A and b ------------")
print (res_max[0], res_max[1], res_max[2] ) # provides the [a, A, b] values

print (" -------- Min Temp curve fit parameters a, A and b ------------")
print (res_min[0], res_min[1], res_min[2] ) # provides the [a, A, b] values
print (" -------- TEMPERATURE PLOTS ------------")
plt.figure()
plt.plot(months, temp_max, 'ro', label = "Max Temp")
plt.plot(months, temp_min, 'bo', label = "Min Temp")
plt.xlabel ("Month")
plt.ylabel ("Min and Max Temps")
plt.plot(months, monthly_temps(months, *res_max), 'r')
plt.plot(months, monthly_temps(months, *res_min), 'b')
plt.legend()
plt.show()
```

```
 -------- Max Temp curve fit parameters a, A and b ------------
39.25 -11.0187802092 0.971110958632
 -------- Min Temp curve fit parameters a, A and b ------------
25.0 7.86539574697 6.48952562921
 -------- TEMPERATURE PLOTS ------------
```