Khatiwada,Prerana
Assignment_5

1.

2. **(a) (5 points) The test error**

No of correctly classified images is: 959
Test Accuracy is: 95.9
Test Error is: 4.09

(b) (2 points) Your termination criterion (multiple options here)

After: Termination criteria is 600 iterations.

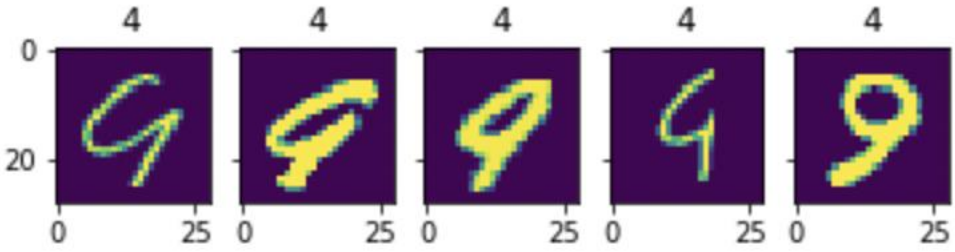
(c) (3 points) The value of the objective function at the optimum

Answer: After 600 iterations, the value of the objective function at the optimum, Cost= [[14.62458634]]

(d) (5 points) In addition, generate a plot of 5 images.

Misclassified images are:

```
No of correctly classified images is: 959
Test Accuracyis: 95.9
Test Error is: 4.099999999999994
```



Khatiwada,Prerana
Assignment_5

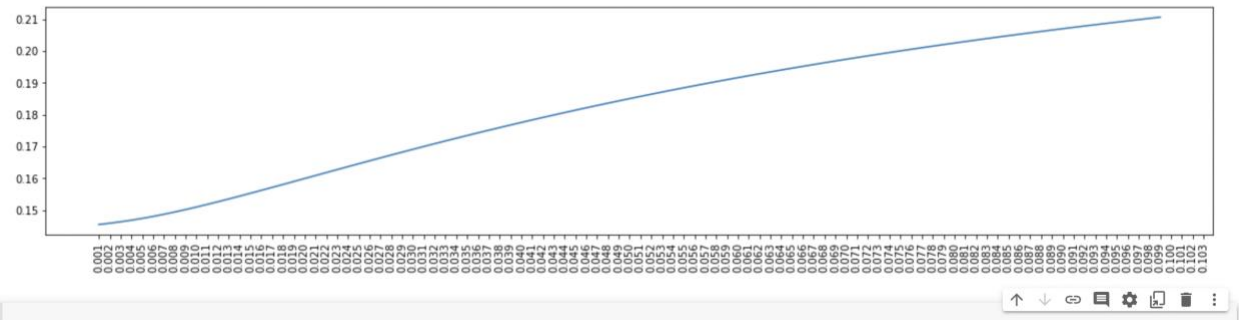
3. **A. Value of w and b when lambda=0.1**

```
lambda22=0.1
W_hat,b_hat=linearPoly(y_list,phi_x,lambda22,n)
print(W_hat,b_hat)
```

```
(10, 4)
(10, 1)
[[ 0.38570654]
 [ 0.09589621]
 [-0.33679745]
 [ 0.03657326]] [[3.15377633]]
```

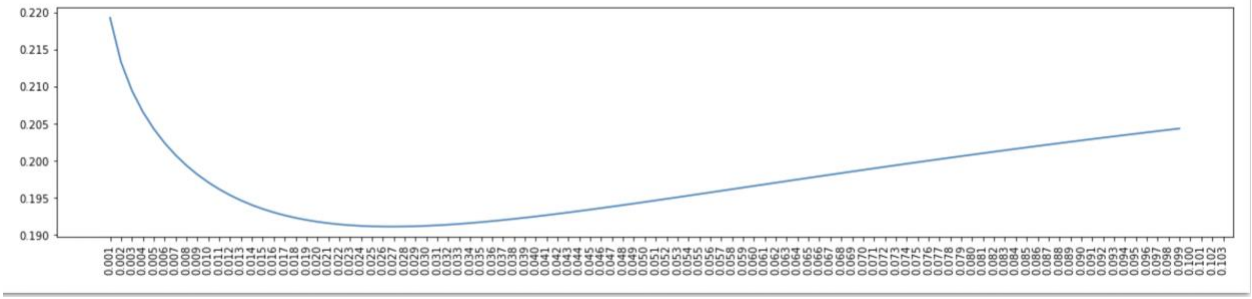
3 b. Training error

```
x = np.copy(lambdaX)
y = np.copy(plt_t)
plt.figure(figsize=(20,4))
plt.xticks(np.arange(min(x), max(x)+0.1, 0.001))
plt.xticks(rotation = 90)
plt.plot(x,y)
plt.show()
```



Testing error

```
x = np.copy(lambdaX)
y = np.copy(plt_test)
plt.figure(figsize=(20,4))
plt.xticks(np.arange(min(x), max(x)+0.1, 0.001))
plt.xticks(rotation = 90)
plt.plot(x,y)
plt.show()
```

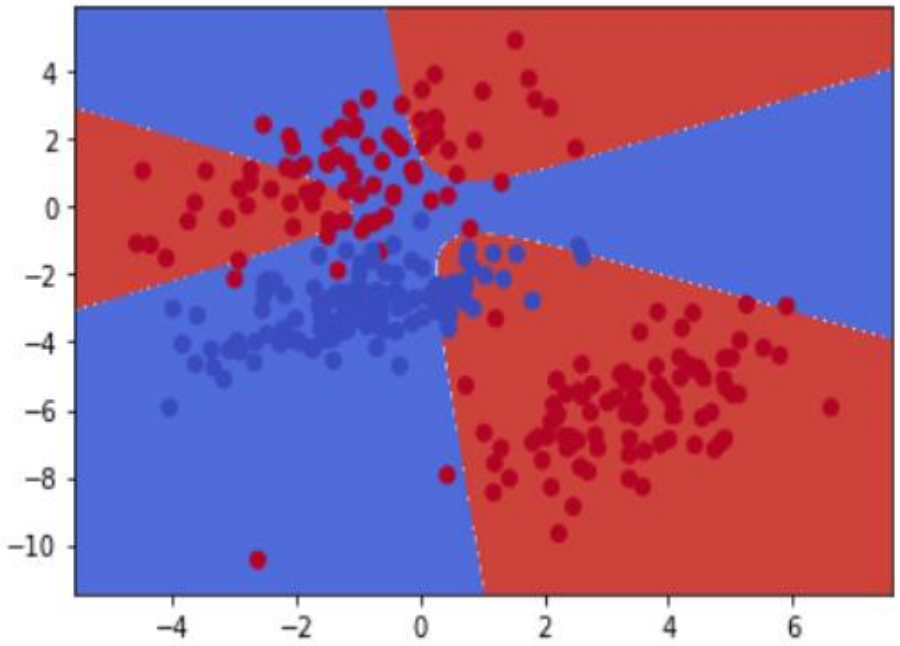


It can be observed that, after changing lambda training error is always increasing.
And testing error decreases and for lambda = 0.026, 0.027, 0.028 testing error are the least. So, any of these could be the optimal value.

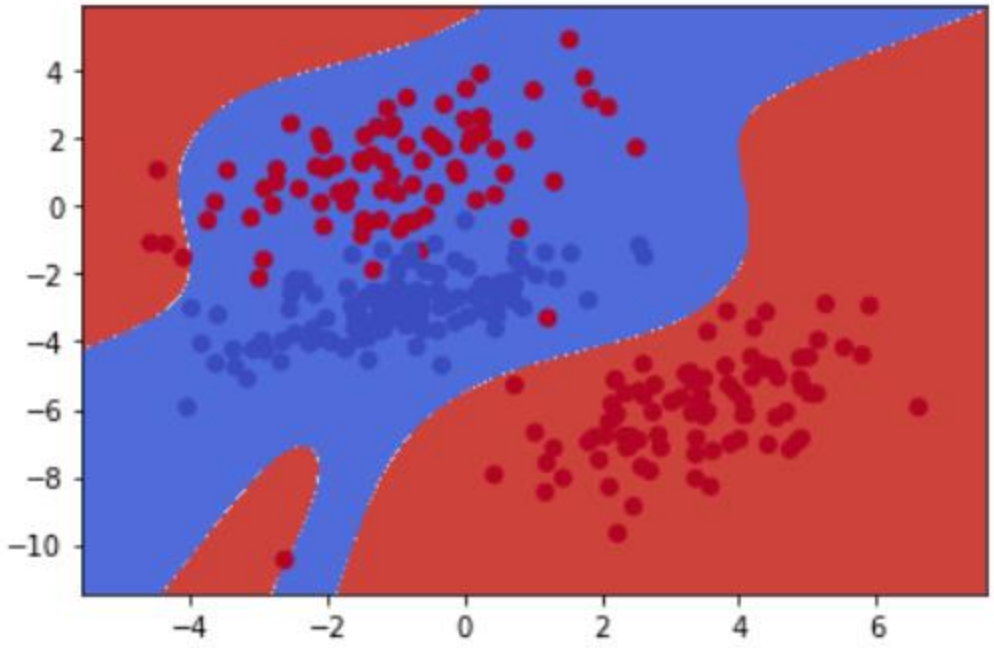
Lambda = 0.027 training and test= `[0.16642524] [0.19114474]`

4.

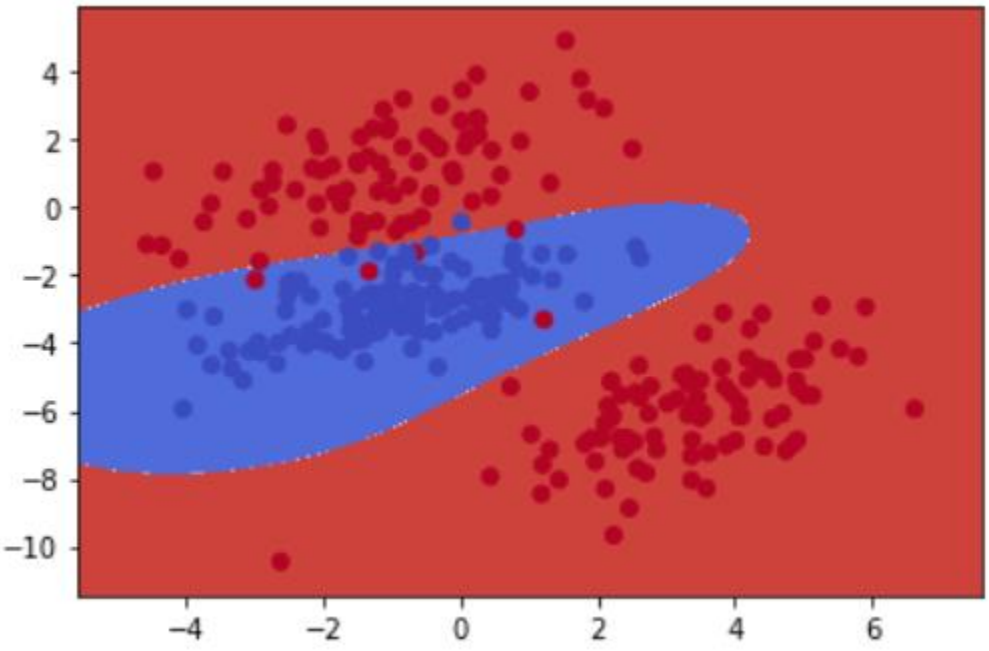
a. Polynomial Kernel with degree 3



b. Polynomial Kernel with degree 10



c. RBF Kernel with gamma 0.1



d. RBF Kernel with gamma 1

Khatiwada,Prerana
Assignment_5