Question 2

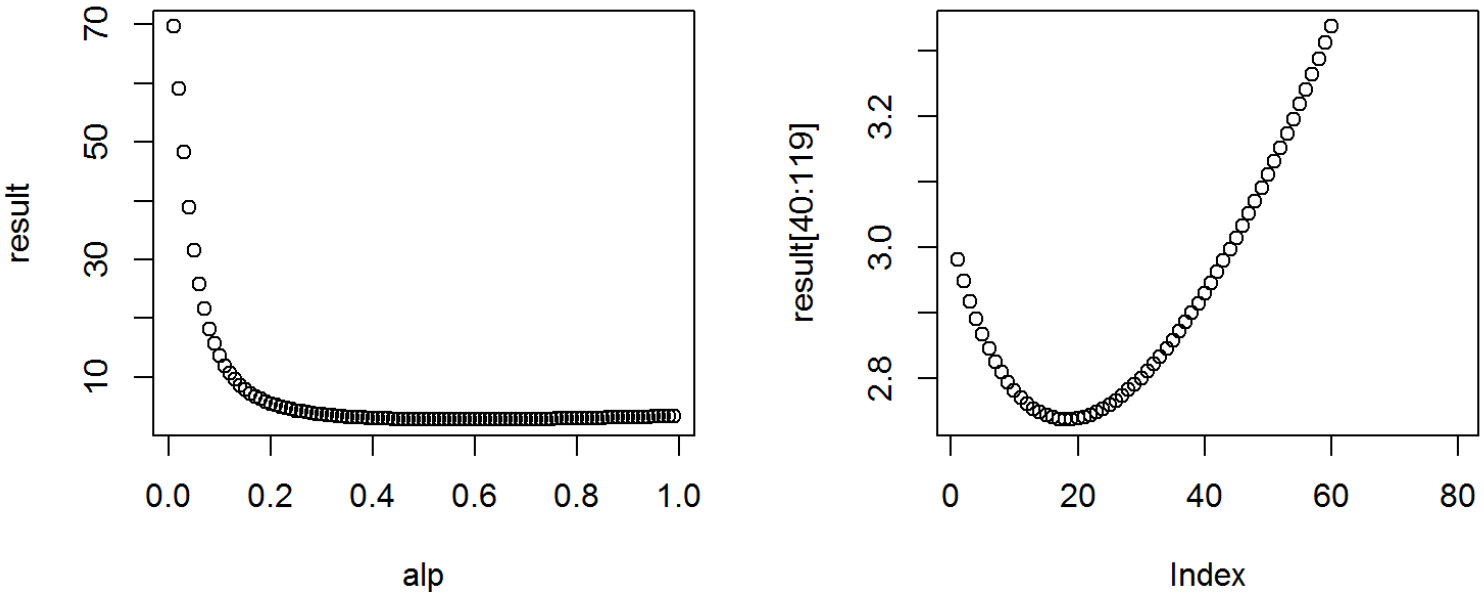
Part a

```
temp<-read.table("temp.txt")
temp<-temp[,1]
alp=c(1:99)/100 #set the alpha vector from 0.01 to 0.99
pmse=function(v) # function for calculating PMSE
{
  p=NULL
  for (j in 1:99)
  {
    al=alp[j]
    beta=v[1]
    se=0
    for (i in 1:(length(v)-1))
    {
      xnext=al*v[i]+(1-al)*beta
      beta=xnext
      se=se+(xnext-v[i+1])^2
    }
    se=se/((length(v))-1)
    p=c(p,se)
  }
  p
}
result=pmse(temp)
result
```

```
##  [1] 69.678362 59.150889 48.219018 38.880847 31.516552 25.865135 21.543394
##  [8] 18.214589 15.620354 13.571681 11.932243 10.603634  9.514255  8.611424
## [15]  7.855897  7.218059  6.675283  6.210076  5.808757  5.460517  5.156728
## [22]  4.890444  4.656021  4.448838  4.265085  4.101596  3.955726  3.825250
## [29]  3.708285  3.603231  3.508722  3.423582  3.346800  3.277498  3.214913
## [36]  3.158381  3.107317  3.061209  3.019606  2.982108  2.948359  2.918045
## [43]  2.890885  2.866626  2.845043  2.825935  2.809117  2.794426  2.781714
## [50]  2.770845  2.761697  2.754159  2.748131  2.743520  2.740242  2.738220
## [57]  2.737384  2.737669  2.739017  2.741373  2.744688  2.748915  2.754012
## [64]  2.759941  2.766666  2.774155  2.782376  2.791303  2.800909  2.811170
## [71]  2.822067  2.833577  2.845683  2.858368  2.871617  2.885416  2.899752
## [78]  2.914613  2.929989  2.945869  2.962247  2.979113  2.996461  3.014285
## [85]  3.032581  3.051342  3.070566  3.090249  3.110389  3.130984  3.152032
## [92]  3.173532  3.195485  3.217890  3.240749  3.264061  3.287830  3.312056
## [99]  3.336743
```

Part b

```
par(mfcol=c(1,2))
plot(alp,result)
plot(result[40:119])
```



From the first plot we cannot see which one is the smallest value, but if we chop off the first 40 results, it is clear that the 57th number is the smallest. Therefore the best value for α is 0.57.

Part c

```
temp<-ts(temp)
temp.ses<-HoltWinters(temp,beta=F,gamma=F)
temp.ses$alpha
```

```
## [1] 0.5723811
```

The smallest value is also $\alpha = 0.57$, same as the answer from part b.

Part d

```
temp.des<-HoltWinters(temp,gamma=F)
temp.des$alpha
```

```
##     alpha
## 0.4671378
```

```
temp.des$beta
```

```
##      beta
## 0.5526951
```

```
temp.des$SSE/118 # MSE for DES model
```

```
## [1] 3.462574
```

```
temp.ses$SSE/119 # MSE for SES model
```

```
## [1] 2.737352
```

Since MSE from SES model is less than MSE from DES model, thus SES model is better