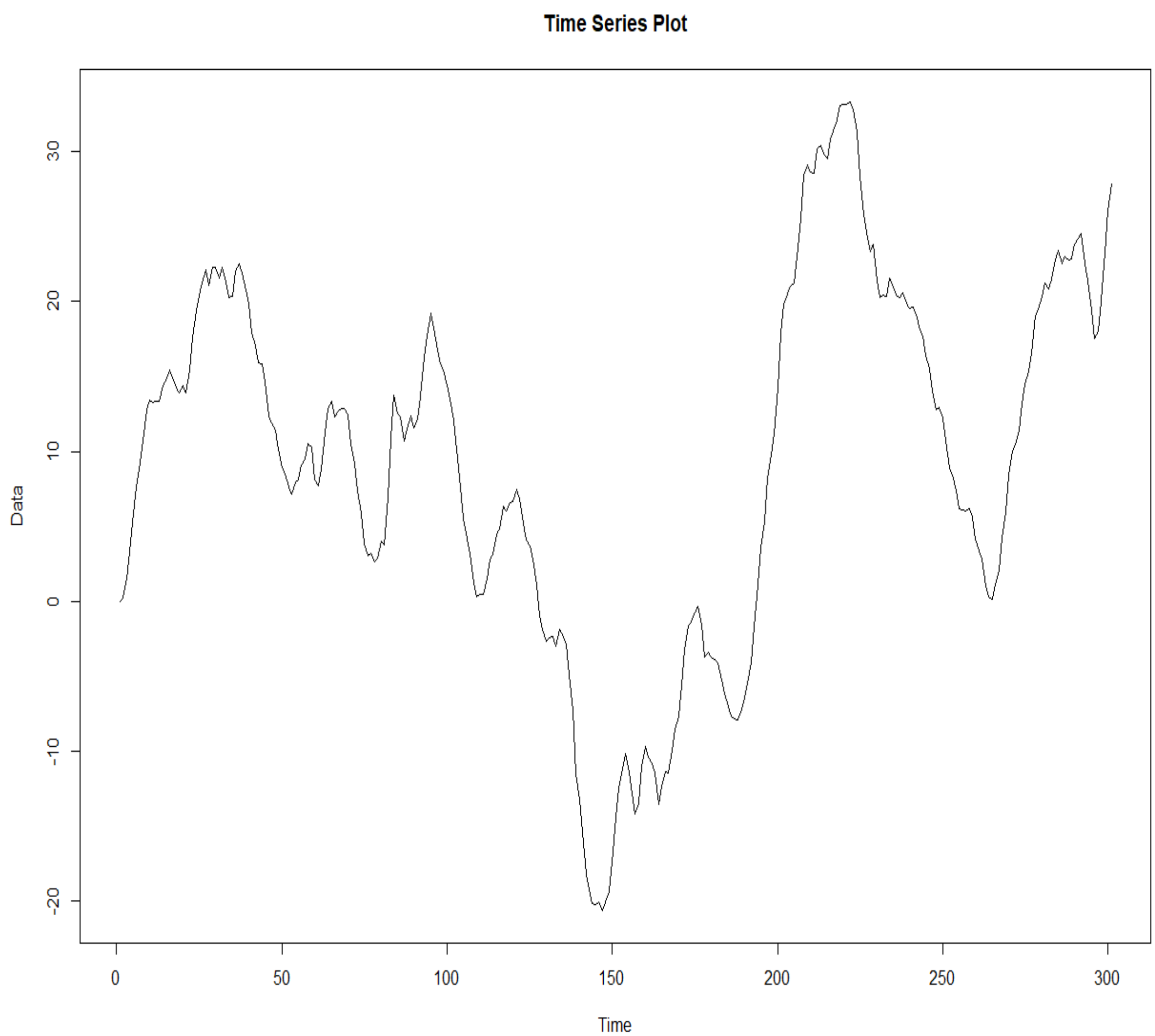
16225

Chathuri Lakshika

(i).

a. Plot the time series giving appropriate labels for each axis and paste the chart into your answer.

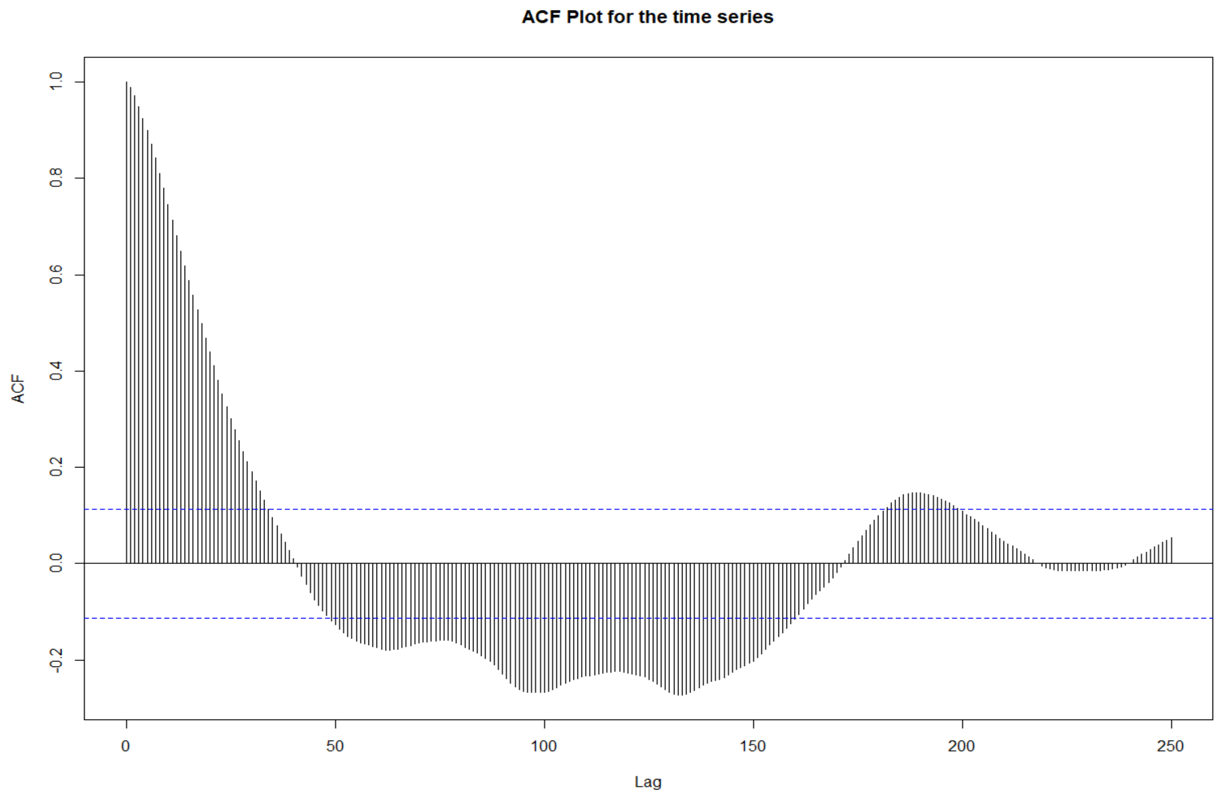


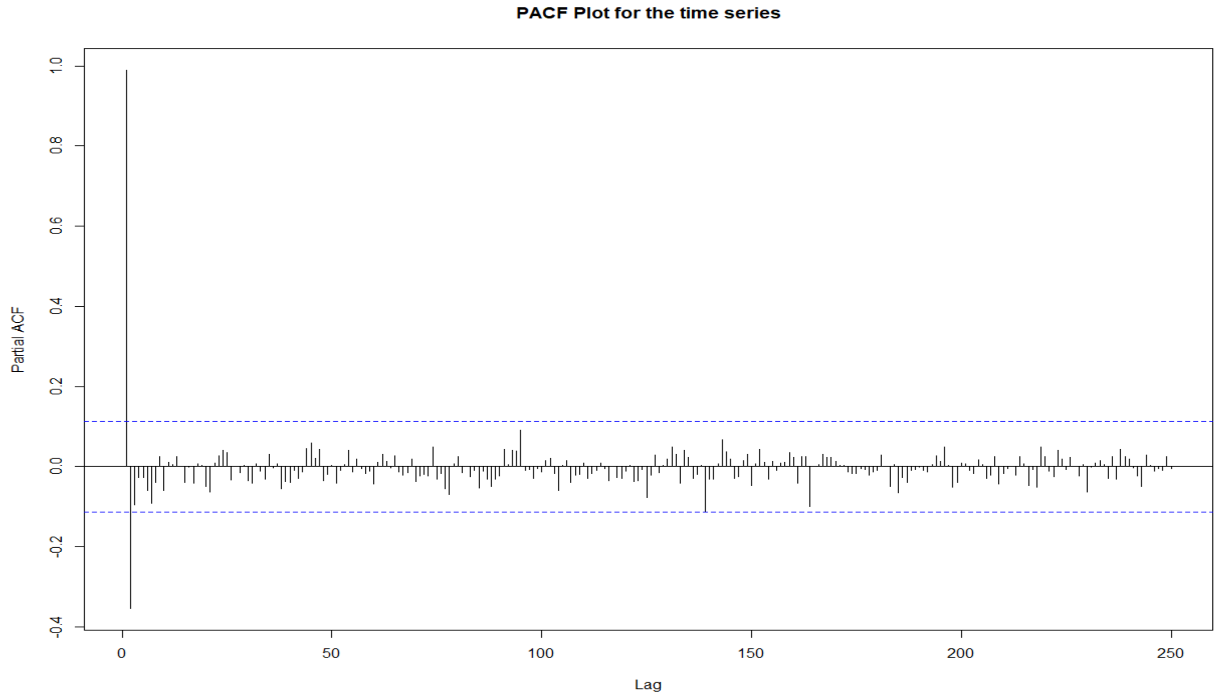
b. Comment on the general features of your chart.

The above time series plot we can see there is no any seasonality and trend can be seen here. Therefore, the series seems to be stationary.

(ii).

a. Plot the sample Autocorrelation function (ACF) and sample Partial Autocorrelation function (PACF) of the original data, giving appropriate labels for each axis and paste the charts into your answer.





b. Comment, by visually inspecting these plots, on the possible modelling strategy which could be adopted.

The ACF and PACF plots indicate that there is a trend and seasonality.

(iii).

a. Perform an appropriate transformation to the data such that a stationary model is possible, pasting any relevant charts into your answer.

Using ADF test,

H0: The time series is non-stationary

H1: The time series is stationary

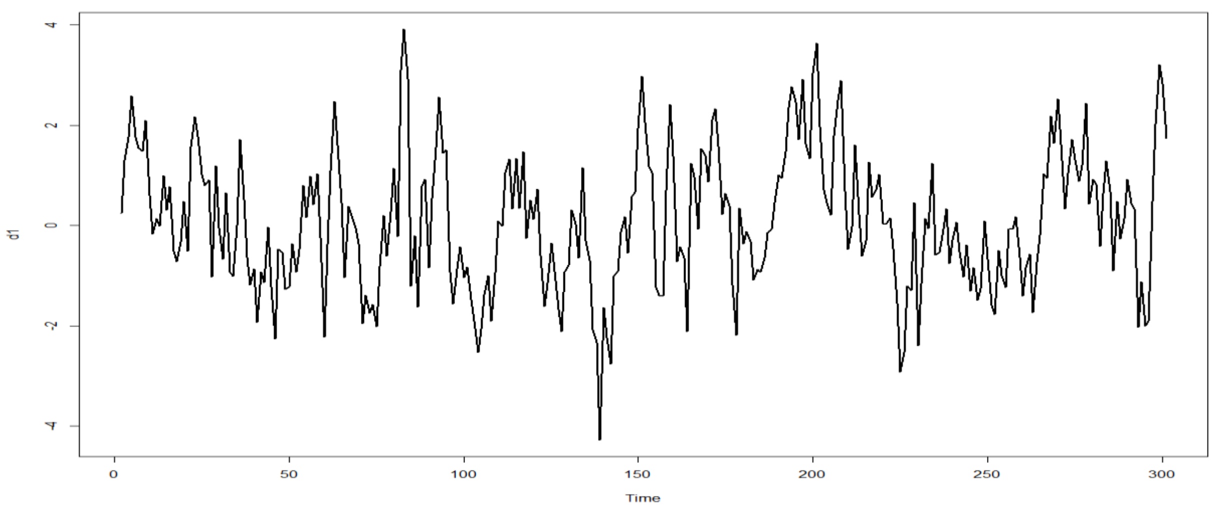
Then we can get

```
> adf.test(y)

        Augmented Dickey-Fuller Test

data:  y
Dickey-Fuller = -2.1369, Lag order = 6, p-value = 0.5186
alternative hypothesis: stationary
```

b. Comment on your answer to part (iii)(a).

P value is greater than the significance level of 5%. Therefore, we do not reject the null hypothesis at 5% level of significance. Hence, we have enough evidence at 5% level of significance to conclude that the time series has a unit root. Having a unit root indicates that the time series is non-stationary.

c. Perform a suitable test to check the stationarity of the data and interpret the results.




```
> adf.test(diff_y,alternative="stationary")

        Augmented Dickey-Fuller Test

data:  diff_y
Dickey-Fuller = -4.906, Lag order = 6, p-value = 0.01
alternative hypothesis: stationary

Warning message:
In adf.test(diff_y, alternative = "stationary") :
  p-value smaller than printed p-value
```

The time plot of differenced seems to be stationary. P value of the ADF test conducted is also less than the significance level of 5%. Therefore, we do reject the null hypothesis at 5% level of significance. Hence, we have enough evidence at 5% level of significance to conclude that the time series do not have a unit root indicating that the time series is stationary.

(iv).

a. Propose an appropriate model for the transformed data.

ARIMA(1, 1, 0)

b. Write the model equation using backshift operator.

$(1-\phi_1 B)(1-B)y_t=\epsilon_t$

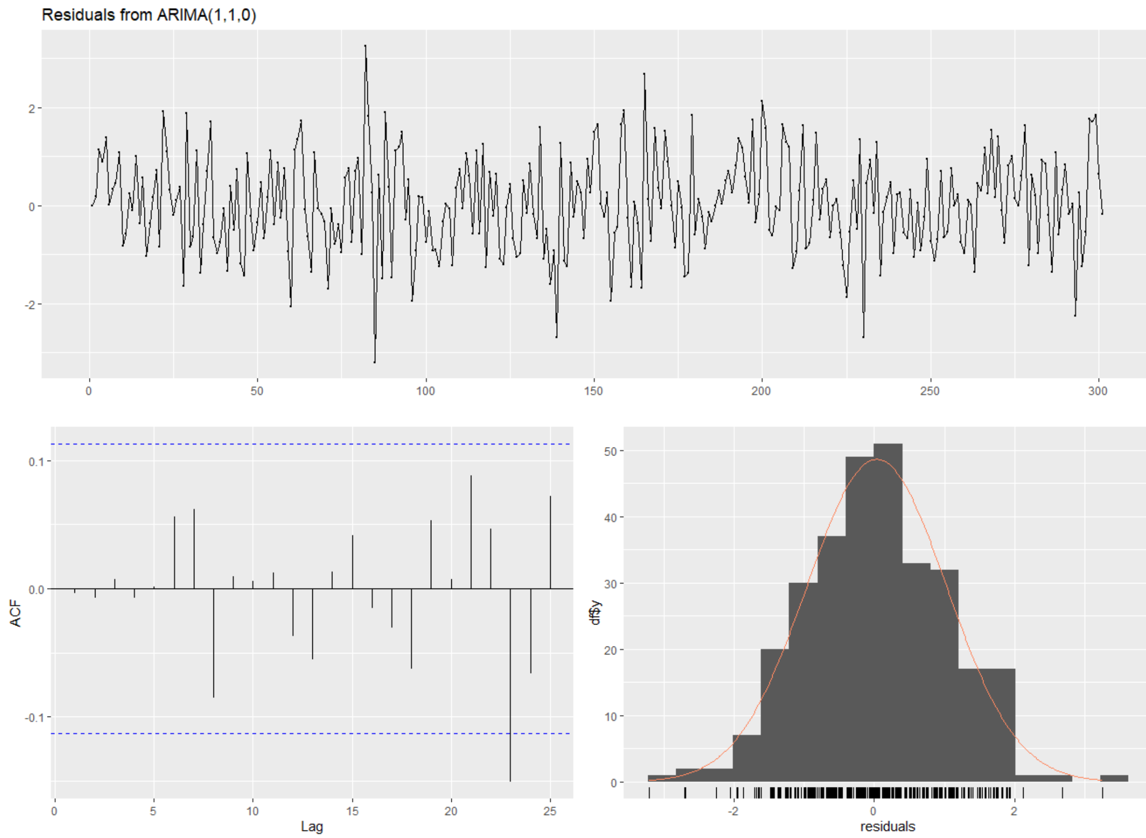
$(1-\phi_1 B)\Delta y_t=\epsilon_t$

where $\Delta yt=y_t-y_{t-1}$

$\Delta y_t=y_t-y_{t-1}=\phi_1(y_{t-1}-y_{t-2})+\epsilon_t$

$y_t = (1+\phi_1)y_{t-1}-\phi_1 y_{t-2}+\epsilon_t$

c. Justify the choice of model in part (iv)(a) by performing an appropriate diagnostic procedure and comparisons with alternative models.



d. Get the forecast for next 6 months from the fitted model.

e. Draw the actual and forecast in the same plot.