Type of assessment:	**Small Test 5 – Research Assignment**	**Qualification:**	**BSc**
Module code:	**STTN326**	**Max:**	**25**
Module description:	**Analysis of Dependent Data**	**Due Date:**	**01/10/2025**
Examiner(s):	**Miss TP Mashamba** **Mr JW Dlamini**		

Question 1

Select a univariate time series data with at least 300 observations (e.g. Inflation data, stock price data, etc)

1.1 Plot the time series (1)
1.2 Comment on trends, seasonality, outliers, and potential non-stationarity. (2)

Question 2

2.1 Test for stationarity using the augmented Dickey-Fuller (ADF) and comment on stationarity. (2)
2.2 If the data is non-stationary,
- 2.2.1 Plot the de-trended data and comment on stationarity. (1)
- 2.2.2 Plot the differenced data and comment on stationarity. (1)
- 2.2.3 Plot the transformed data and comment on stationarity. (1)

2.3 Test whether the data follows a random walk. (1)
2.4 Test whether the data follows a random walk with drift. (1)

Question 3

3.1 Plot the ACF and $PACF$. (1)
3.2 Use the sample ACF and PACF for model identification, and justify the choice of the $ARIMA\ (p,d,q)$ model. (1)
3.3 Apply the test for individual ACF as well as the portmanteau tests to test for autocorrelations. (3)

Question 4

4.1 Estimate $ARIMA(p,d,q)$ model parameters. (1)
4.2 Compare method of moments, maximum likelihood method and least squares method, estimation of $ARIMA(p,d,q)$ model parameters. (3)
4.3 Examine residuals of the time plot, ACF of residuals, histogram / normal Q-Q plot, explain their significance. (2)

Question 5

5.1 Generate forecasts for 10–20 future time periods. (1)
5.2 Plot forecast with 95% confidence intervals. (1)
5.3 Comment on the practical meaning of the forecast in the context of the chosen data. (2)

TOTAL/TOTAAL: 25