

UNIVERSITI KUALA LUMPUR
BUSINESS SCHOOL

FINAL EXAMINATION
MARCH 2026 SEMESTER

COURSE CODE : EHB30603
COURSE TITLE : TIME SERIES AND FORECASTING
PROGRAMME NAME : BACHELOR IN FINANCIAL TECHNOLOGY WITH HONOURS
DATE : 24 JUNE 2026
TIME : 9:00AM - 12:00PM
DURATION : 3 HOURS

INSTRUCTIONS TO CANDIDATES

1. Please read the Instructions given in the question paper CAREFULLY.
2. This question paper is printed on both sides of the paper.
3. This question paper consist of ONE sections.
4. Section A consist of five questions. Answer FOUR (4) questions only.
5. Please write your answer on the answer booklet provided.
6. Please answer all questions in English only.
7. Refer to the attached Formula/ Appendies. ☐ Tick if applicable

THERE ARE 11 PAGES OF QUESTIONS INCLUDING THIS PAGE

SECTION A (Total: 100 marks)

Answer FOUR (4) questions.

Please use the answer booklet provided.

Question 1

Answer ALL the questions below:

- (a) State TWO (2) objectives to be achieved when analysing the time series data.
(4 marks)
- (b) State TWO (2) methods to identify trend in time series analysis.
(2 marks)
- (c) A sample of ten households in Taman Maluri was chosen to determine the relationship between their monthly income and savings for the month of Dec 2025. The researcher obtained the following data.
Refer Below - Table1 : monthly income and savings data .

Table 1: monthly income and savings data

Income (RM'00)	Saving (RM'00)
50	14
45	8.0
34	9.5
10	2.1
35	5.5
22	7.5
12	2.2
15	3.0
25	5.5
11	2.0

- i. Plot the above data on the graph paper.
(5 marks)
- ii. Using the least squares method, find the regression line for the above data
(8 marks)

- iii. Below is an incomplete ANOVA table for regression model. Calculate the value in cell (i) to (vi).

Refer Below - Table2 : ANOVA .

(6 marks)

Table 2: ANOVA

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	(i)	(iii)	109.8738	(vi)	.000
Residual	(ii)	(iv)	(v)		
Total	137.601	9			

Question 2

Answer ALL the questions below:

- (a) State the main consequence of a 'random shock' on the time series.

(3 marks)

- (b) The following table shows the number of rejected items recorded by SARAH SAUCE factory over the past 5 years.

Refer Below - Table3 : Number of rejected items .

Table 3: Number of rejected items

Year	1 st term (Jan-Apr)	2 nd term (May-Aug)	3 rd term (Sept-Dec)
2014	-	202	199
2015	274	232	240
2016	364	387	380
2017	350	349	341
2018	332	-	-

- i. Plot the above data on a graph paper.

(3 marks)

- ii. Calculate the trend values using the 3-term moving average method.

(3 marks)

- iii. Plot the trend values on the same graph in (i).

(1 marks)

- iv. Determine the seasonal indices for each quarter.

(7 marks)

- v. Comment on the values of seasonal index for the first and the third term.

(4 marks)

- vi. If the trend equation is $T = 207.2121 + 14.9161t$, forecast the number of rejected items for the first term of 2019.

(4 marks)

Question 3

Answer ALL the questions below:

- (a) Time series analysis can be described with **TWO (2)** types of relationship of the components. Briefly explain the **TWO (2)** types for each relationship.

(5 marks)

- (b) Data below indicate the amount of sales for certain product. As a statistician, you are required by your manager to determine the best forecast model for this data.

Refer Below - Table4 : Amount of sales for 2011 - 2018 .

Table 4: Amount of sales for 2011 - 2018

Model 1:

$$S_t = \alpha y_t + (1 - \alpha)S_{t-1}$$

$$S'_t = \alpha S_t + (1 - \alpha)S'_{t-1}$$

$$a_t = 2S_t - S_{t-1}$$

$$b_t = \frac{\alpha}{1-\alpha}(S_t - S'_t)$$

$$F_{t+m} = a_t - b_t \times m$$

Use $\alpha = 0.6$, m = number of steps ahead.

Model 2:

$$F_{t+1} = y_t \frac{y_t}{y_{t-1}}$$

Time (t)	y_t (RM Million)
2011	20
2012	16
2013	22
2014	25
2015	28
2016	30
2017	31
2018	35

- i. Name each of the **TWO (2)** models above

(2 marks)

- ii. Show how to generate the fitted values for **TWO (2)** models above using the data given.

(9 marks)

- iii. By using the MSE and MAPE determine the model that fits the data best.
Note: You are to use the first **SIX (6)** observations to estimate the models and the last **TWO (2)** observations for your evaluation purposes.

(5 marks)

- iv. Forecast the sales for 2019 using the model that you determine in (c).

(4 marks)

Question 4

Following is the sales of Liquefied Natural Gas (LNG) in Malaysia for the year 2013 to 2023.
Refer Below - Table5 : Sales of Liquefied Natural Gas (LNG) in Malaysia .

Table 5: Sales of Liquefied Natural Gas (LNG) in Malaysia

Year	Sales (RM million)
2013	138
2014	71
2015	147
2016	111
2017	184
2018	134
2019	280
2020	185
2021	267
2022	298
2023	320

- (a) Show that for a linear trend its first difference is stationary. Plot the graph.

(5 marks)

- (b) Calculate **FIVE (5)** lags of the ACF and PACF.

(18 marks)

- (c) Identify the suitable models to be fitted to the given data series.

(2 marks)

Question 5

Answer ALL the questions below:

- (a) Re-write the below equation in terms of ARMA notation. Given the following model:
Refer Below - Figure1 : ARMA Notation .

(2 marks)

$$Y_t = \mu + \phi_1 Y_{t-1} + \phi_2 Y_{t-2} + \varepsilon_t + \theta_1 \varepsilon_{t-1} + \theta_2 \varepsilon_{t-2}$$

Figure 1: ARMA Notation

- (b) The following figures represent the ACF and PACF, respectively of a series in first difference. What is the best model specification of each ACF and PACF plots below?

- i. Diff Data: 1

Refer Below - Figure2 : ACF & PACF Plot .

(2 marks)

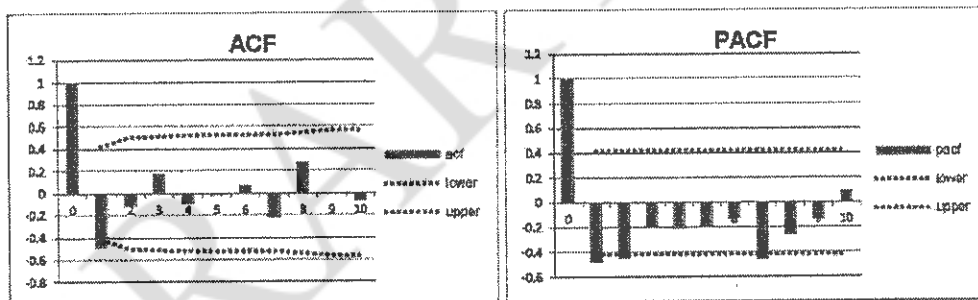


Figure 2: ACF & PACF Plot

- ii. Diff Data: 1

Refer Below - Figure3 : ACF & PACF Plot .

(2 marks)

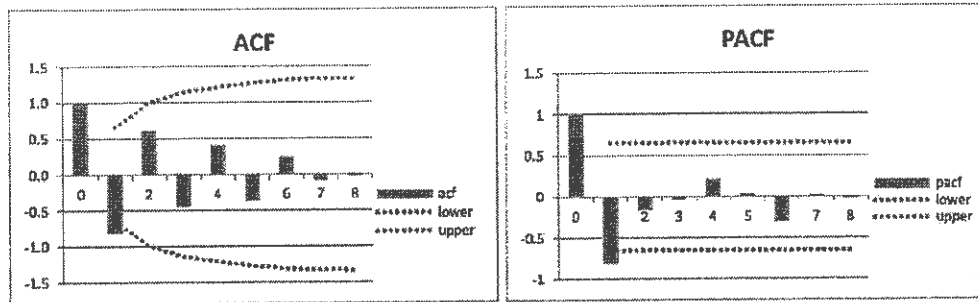


Figure 3: ACF & PACF Plot

- (c) *Figures 1 to 7 (Appendix 1) were plotted based on data monthly production crude palm oil taken over a ten (10) years period. The original data as given below. You are to observe and study these figures carefully. Based on the information obtained, answer the following questions:*

Refer Appendix Attachment - Appendix 1 (1) .

- i. Describe the significant features of the time series using the information as provided by each the *Figures 1 till 7*.

(10 marks)

- ii. Identify the most appropriate form of ARIMA model suitable for this data set.

(5 marks)

- iii. Rewrite the model obtained in *Part (ii)* above in full using backward shift operator, B

(4 marks)

END OF EXAMINATION PAPER

APPENDIX

Appendix for Section A Question 5 (c) : Appendix 1 (1)

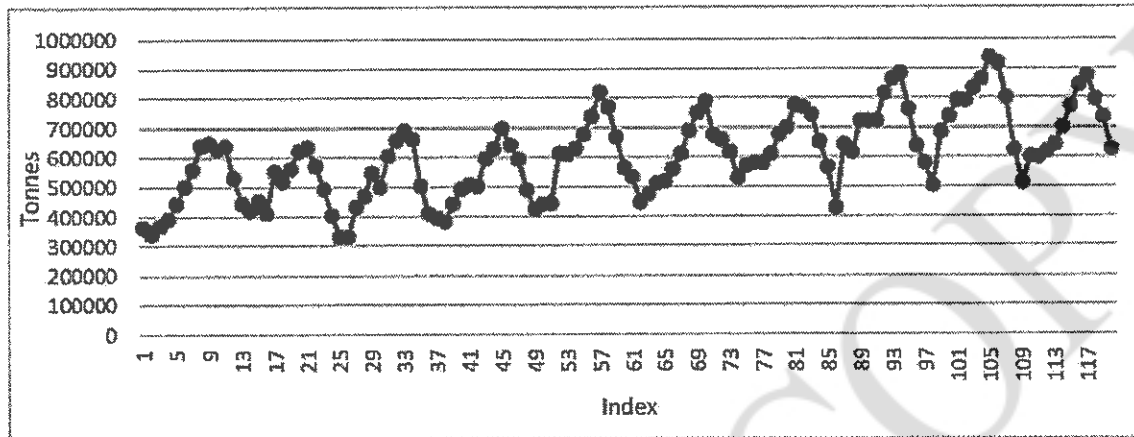


Figure 1: Original Data

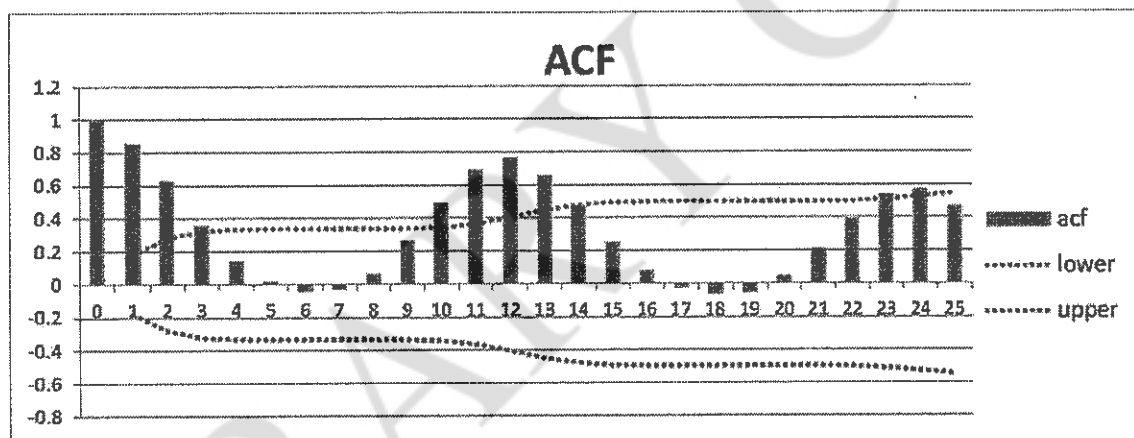


Figure 2: ACF Original Series

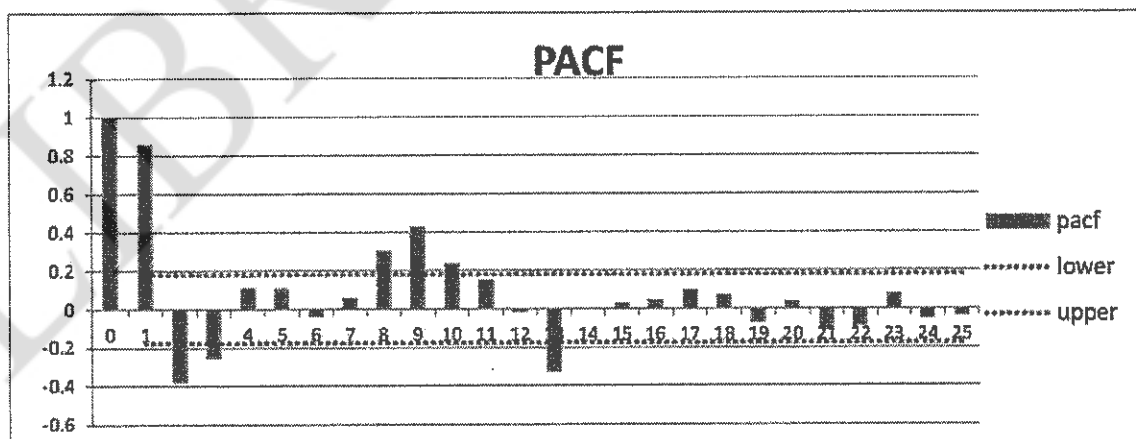


Figure 3: PACF Original Series

Appendix for Section A Question 5 (c) : Appendix 1 (2)

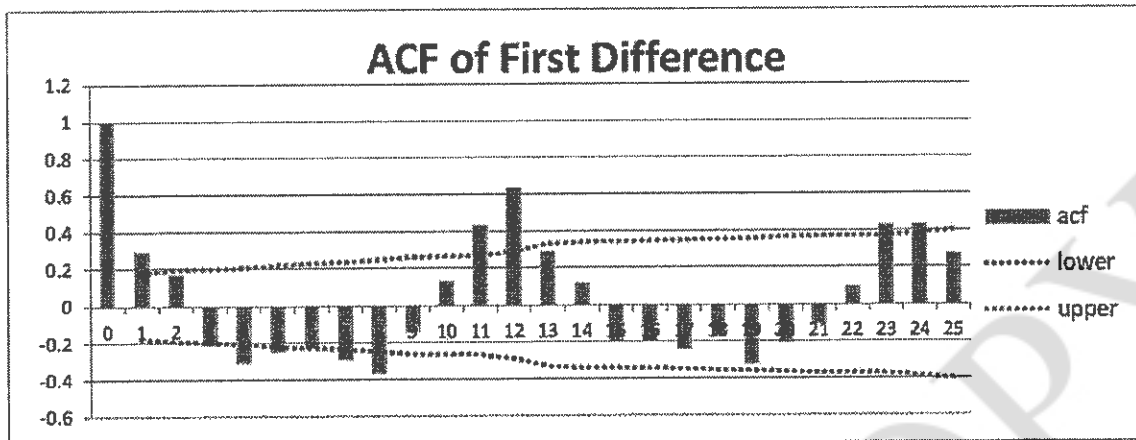


Figure 4: ACF of First Difference

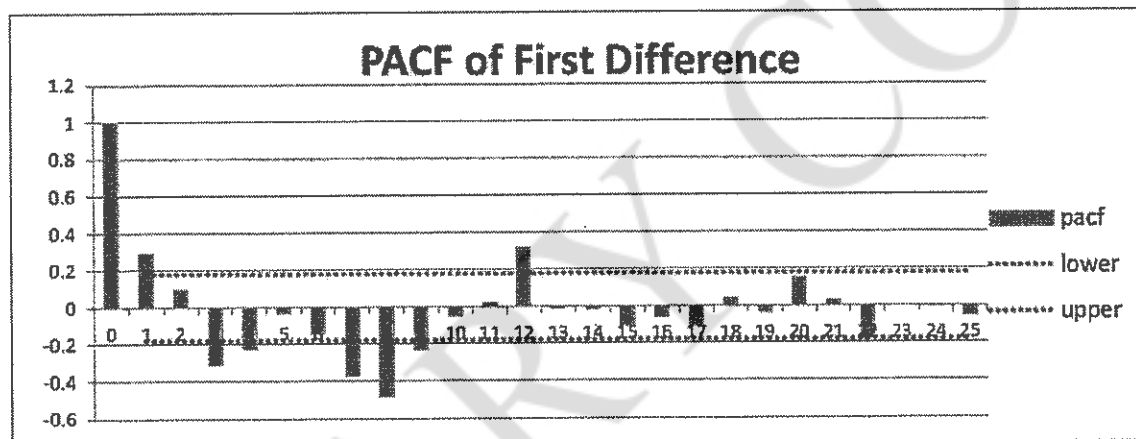


Figure 5: PACF of First Difference

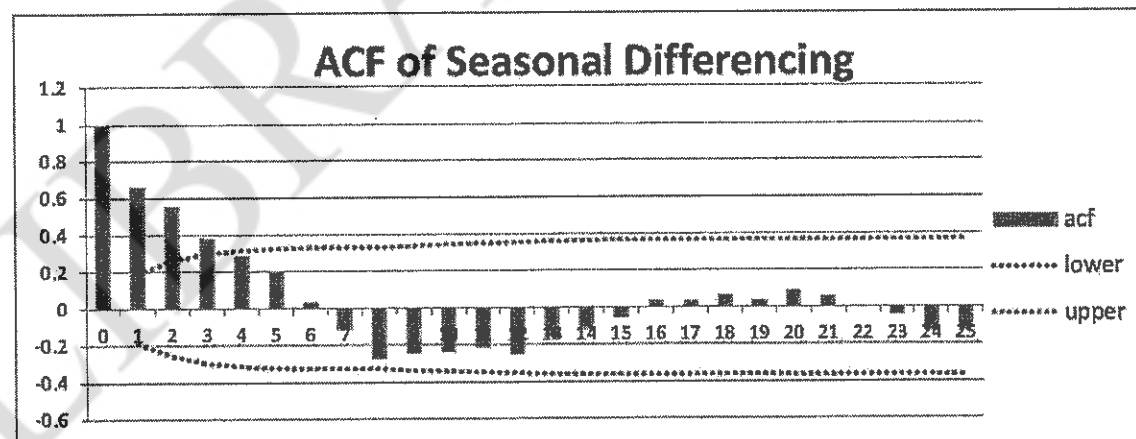


Figure 6: ACF of Seasonal Differencing

Appendix for Section A Question 5 (c) : Appendix 1 (3)

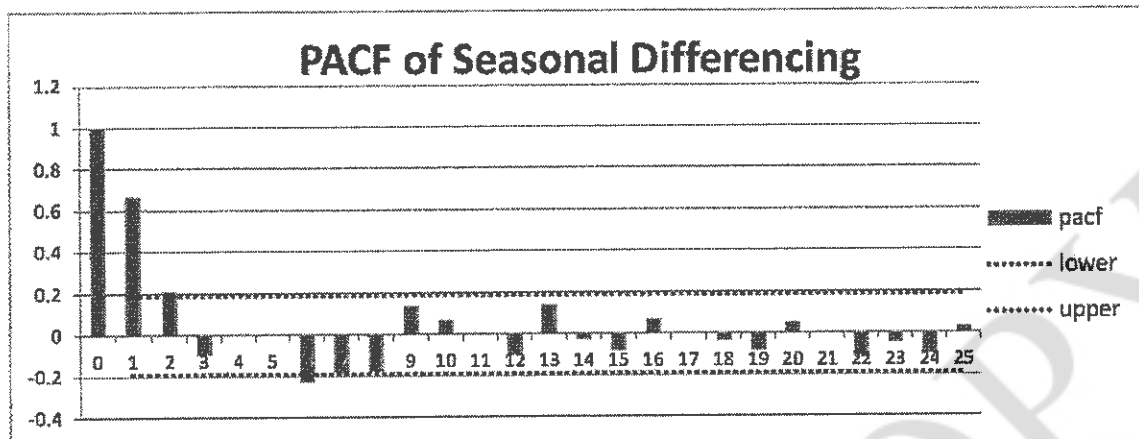


Figure 7: PACF of Seasonal Differencing