NAMIBIA UNIVERSITY
OF SCIENCE AND TECHNOLOGY

**FACULTY OF MANAGEMENT SCIENCES**

**DEPARTMENT OF MARKETING AND LOGISTICS**

| **QUALIFICATION: BACHELOR OF LOGISTICS AND SUPPLY CHAIN MANAGEMENT** | |
|---|---|
| **QUALIFICATION CODE: 07BLSC** | **LEVEL:** 6 |
| **COURSE CODE:** FDA621S | **COURSE NAME:** FORECASTING AND DATA ANALYSIS |
| **SESSION:** NOVEMBER 2019 | **PAPER:** THEORY |
| **DURATION:** 3 HOURS | **MARKS:** 100 |

| **FIRST OPPORTUNITY EXAMINATION QUESTION PAPER** | |
|---|---|
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| **MODERATOR:** | Ms. Gloria Tshoopara |

| **INSTRUCTIONS** |
|---|
| 1. This paper consists of **2 Sections, A and B**<br>2. Answer **ALL 4** questions in all sections<br>3. Read each question carefully<br>4. Write as legible and precise as possible<br>5. Indicate your class lecturer's name on your answer sheet |

**THIS EXAMINATION QUESTION PAPER CONSISTS OF 7 PAGES (Including this front page)**

**SECTION A** **[30 MARKS]**

**QUESTION 1:** **[30 marks]**

**MULTIPLE CHOICE**

There are ten multiple choice questions with several possible choices each, choose the best possible answer e.g. 1.1 A. **Each question is worth 2 marks.**

1. Sum of weights in exponential smoothing is _____. [2 marks]
   a) <1
   b) 1
   c) >1
   d) None of the above

2. If the demand is 100 during October 2016, 200 in November 2016, 300 in December 2016, 400 in January 2017. What is the 3-month simple moving average for February 2017? [2 marks]
   a) 300
   b) 333
   c) 250
   d) Need more information

3. The last period's forecast was 70 and demand was 60. What is the simple exponential smoothing forecast with alpha of 0.4 for the next period? [2 marks]
   a) 63.8
   b) 65
   c) 62
   d) 66

4. For this set of errors: -1, -4, 0, +2, +3, MAD is: [2 marks]
   a) 1
   b) 0
   c) 2
   d) -2

5. Calculate a weighted 3 month moving average forecast for period 7, using a weight of 0.50 to the most recent period, 0.40 for the next recent period and 0.30 for the most distant period? [2 marks]
   a) 46.6
   b) 47.6
   c) 48.6
   d) 49.6

| Period | Demand |
|---|---|
| 1 | 38 |
| 2 | 40 |
| 3 | 42 |
| 4 | 40 |
| 5 | 44 |
| 6 | 38 |
| 7 | ? |

6. Simple exponential smoothing is being used to forecast demand. The previous forecast of 66 turned out to be six units less than actual demand. The next forecast is 66.9, implying a smoothing constant, alpha, equal to: [2 marks]
    a) 0.01
    b) 0.15
    c) 0.10
    d) 0.20

7. The cumulative forecast error is important for determining the: [2 marks]
    a) Mean squared error.
    b) Bias in forecast error.
    c) Mean absolute deviation.
    d) Control limits

8. Time series methods discover [2 marks]
    a) Pattern in historical data and project it into the future.
    b) Include cause-effect relationships.
    c) Are useful when historical information is not available.
    d) All of the alternatives are true

9. The measure of forecast error where the absolute amount of error of each forecast is averaged is? [2 marks]
    a) Mean squared error (MSE).
    b) Mean absolute deviation (MAD).
    c) Mean absolute percentage error (MAPE).
    d) Bias.

10. Which of the following is not a step to help an organization perform effective forecasting? [2 marks]
    a) Understand the objective of forecasting.
    b) Integrate demand planning and forecasting throughout the supply chain.
    c) Understand and identify customer segments.
    d) Identify and understand supplier requirements

11. Which of the following is suitable for launching a new product? [2 marks]
    a) Moving average
    b) Product life cycle analysis
    c) Exponential smoothing
    d) all of the above

12. _____Helps to set strategy for the firm to meet demand at an aggregated level usually encompasses a period of time longer than two years. [2 marks]
    a) Strategic forecasting
    b) Tactical forecasting
    c) Operation
    d) All of the above

13. Mature products with stable demand [2 marks]
    a) Are usually easiest to forecast.
    b) Are usually hardest to forecast.
    c) Cannot be forecast.
    d) Do not need to be forecast.

14. The moving average forecast method is used when? [2 marks]
    a) Demand has observable trend or seasonality.
    b) Demand has no observable trend or seasonality.
    c) Demand has observable trend and seasonality.
    d) Demand has no observable level or seasonality

15. In which of the following forecasting technique, subjective inputs obtained from various sources are analysed? [2 marks]
    a) Judgemental forecast
    b) Time series forecast
    c) Associative model
    d) All of the above

**Section A subtotal: 30 marks**

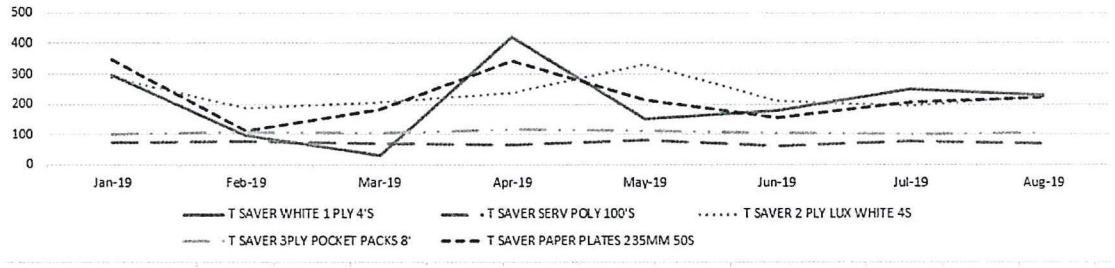
## SECTION B: STRUCTURED QUESTIONS [70 MARKS]

## QUESTION 2 [15 marks]

2.1 Analyse the below inventory scenarios, both scenarios used a 4 month moving average, critique August forecast and MAPE for each scenario? [10 marks]

### Scenario A

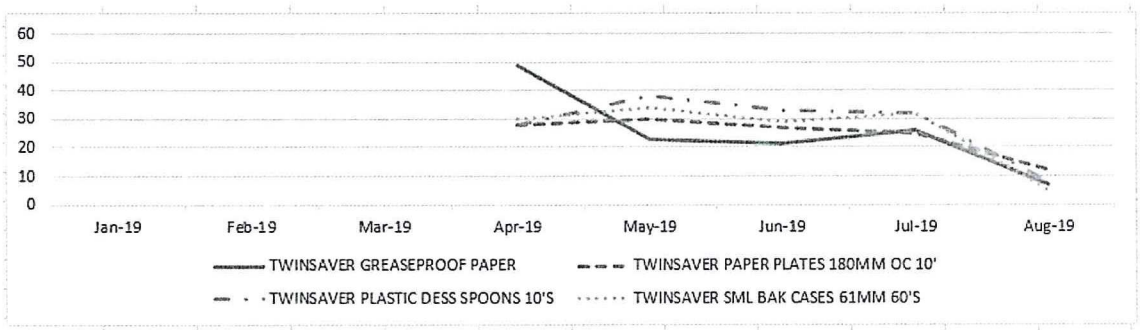
| Product Description | Jan-19 | Feb-19 | Mar-19 | Apr-19 | May-19 | Jun-19 | Jul-19 | Aug-19 | Aug. forecast | stock on hand | \|error\| |
|---|---|---|---|---|---|---|---|---|---|---|---|
| T SAVER WHITE 1 PLY 4'S | 296 | 98 | 30 | 421 | 150 | 180 | 248 | 231 | 250 | 321 | 8% |
| T SAVER SERV POLY 100'S | 74 | 75 | 68 | 65 | 80 | 62 | 75 | 68 | 71 | 61 | 4% |
| T SAVER 2 PLY LUX WHITE 4S | 289 | 187 | 206 | 237 | 331 | 208 | 195 | 227 | 243 | 358 | 7% |
| T SAVER 3PLY POCKET PACKS 8' | 101 | 108 | 104 | 115 | 113 | 105 | 102 | 104 | 109 | 37 | 5% |
| T SAVER PAPER PLATES 235MM 50S | 347 | 110 | 182 | 343 | 213 | 154 | 207 | 221 | 229 | 108 | 4% |
| | | | | | | | | | | MAPE | 5% |




### Scenario B

| Product Description | Jan-19 | Feb-19 | Mar-19 | Apr-19 | May-19 | Jun-19 | Jul-19 | Aug-19 | Aug. forecast | stock on hand | \|error\| |
|---|---|---|---|---|---|---|---|---|---|---|---|
| TWINSAVER GREASEPROOF PAPER | | | | 49 | 23 | 21 | 26 | 7 | 30 | 34 | 325% |
| TWINSAVER PAPER PLATES 180MM OC 10' | | | | 28 | 30 | 27 | 25 | 12 | 28 | 34 | 129% |
| TWINSAVER PLASTIC DESS SPOONS 10'S | | | | 28 | 38 | 33 | 32 | 8 | 33 | 26 | 309% |
| TWINSAVER SML BAK CASES 61MM 60'S | | | | 30 | 34 | 29 | 32 | 5 | 31 | 23 | 525% |
| | | | | | | | | | | MAPE | 322% |

### Hint: analyse the stock on hand



**2.2 You have tried to forecast your demand using exponential smoothing with alpha = 0.3.**

**[5 marks]**

| Period | Actual At | Forecast Ft | At-Ft | (At - Ft)^2 | abs(At-Ft) |
|---|---|---|---|---|---|
| 1 | 37 | 37 | 0.00 | 0.00 | 0.00 |
| 2 | 40 | 37.0 | 3.00 | 9.00 | 3.00 |
| 3 | 41 | 37.9 | 3.10 | 9.61 | 3.10 |
| 4 | 37 | 38.8 | -1.83 | 3.35 | 1.83 |
| 5 | 45 | 38.3 | 6.72 | 45.14 | 6.72 |
| 6 | 50 | 40.3 | 9.70 | 94.15 | 9.70 |
| 7 | 41 | 43.2 | -2.21 | 4.87 | 2.21 |
| 8 | 47 | 42.5 | 4.45 | 19.84 | 4.45 |
| 9 | 40 | 43.9 | -3.88 | 15.07 | 3.88 |
| 10 | 52 | 42.7 | 9.28 | 86.17 | 9.28 |
| 11 | 42 | 45.5 | -3.50 | 12.26 | 3.50 |
| 12 | 54 | 44.5 | 9.55 | 91.17 | 9.55 |
| | | 47.3 | | | |
| | | | | | |
| Sum | 526.0 | 491.6 | 34.4 | 390.7 | 57.2 |

a) Calculate the Tracking Signal. [3 marks]

b) Is your forecast doing well? Justify your answer. [2 marks]

**QUESTION 3** **[30 MARKS]**

3.1 Evaluate any 5 importance of data analytics to an organizations [20 marks]

3.2 Discuss any 5 common features and assumptions inherent in forecasting? [5 marks]

3.3 Explain why it is more challenging to forecast for a new product? [5 marks]

## QUESTION 4 [25 MARKS]

Analyse the multiple regression output shown below and answer below questions

**Demand estimation using linear regression**

| | Y | X1 | X2 | X3 | X4 |
|---|---|---|---|---|---|
| City | Number of weekly riders | Price per week | Population of city | Monthly income of riders | Average parking rates per month |
| 1 | 192,000 | $15 | 1,800,000 | $5,800 | $50 |
| 2 | 190,400 | $15 | 1,790,000 | $6,200 | $50 |
| 3 | 191,200 | $15 | 1,780,000 | $6,400 | $60 |
| 4 | 177,600 | $25 | 1,778,000 | $6,500 | $60 |
| 5 | 176,800 | $25 | 1,750,000 | $6,550 | $60 |
| 6 | 178,400 | $25 | 1,740,000 | $6,580 | $70 |
| 7 | 180,800 | $25 | 1,725,000 | $8,200 | $75 |
| 8 | 175,200 | $30 | 1,725,000 | $8,600 | $75 |
| 9 | 174,400 | $30 | 1,720,000 | $8,800 | $75 |
| 10 | 173,920 | $30 | 1,705,000 | $9,200 | $80 |

SUMMARY OUTPUT

| *Regression Statistics* | |
|---|---|
| Multiple R | 0.994408579 |
| R Square | 0.988848422 |
| Adjusted R Square | 0.979927159 |
| Standard Error | 1031.084247 |
| Observations | 10 |

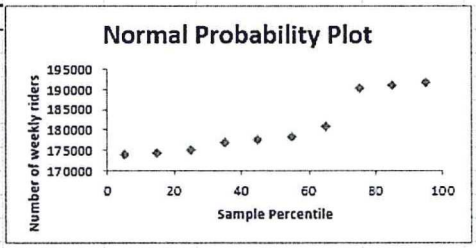
ANOVA

| | *df* | *SS* | *MS* | *F* | *Significance F* |
|---|---|---|---|---|---|
| Regression | 4 | 471358886.4 | 117839722 | 110.84176 | 0.000045596939 |
| Residual | 5 | 5315673.625 | 1063134.73 | | |
| Total | 9 | 476674560 | | | |

| | *Coefficients* | *Standard Error* | *t Stat* | *P-value* | *Lower 95%* | *Upper 95%* |
|---|---|---|---|---|---|---|
| Intercept | 107588.6343 | 89284.2569 | 1.20501237 | 0.2821151 | -121923.8547 | 337101.123 |
| Price per week | -1360.467369 | 122.1788478 | -11.1350483 | 0.0001019 | -1674.538096 | -1046.39664 |
| Population of city | 0.048914433 | 0.046092299 | 1.0612279 | 0.3371339 | -0.069569592 | 0.16739846 |
| Monthly income of riders | 1.5006352 | 0.697001046 | 2.15298845 | 0.0839273 | -0.291063027 | 3.29233343 |
| Average parking rates per month | 135.2881792 | 128.1012734 | 1.05610331 | 0.3392548 | -194.0066273 | 464.582986 |

RESIDUAL OUTPUT

| *Observation* | *Predicted Number of weekly riders* | *Residuals* |
|---|---|---|
| 1 | 190695.6968 | 1304.303243 |
| 2 | 190806.8065 | -406.8065041 |
| 3 | 191970.671 | -770.671003 |
| 4 | 178418.232 | -818.2319678 |
| 5 | 177123.6596 | -323.6595966 |
| 6 | 178032.4161 | 367.5838884 |
| 7 | 180406.1695 | 393.8304677 |
| 8 | 174204.0868 | 995.9132321 |
| 9 | 174259.6416 | 140.3583585 |
| 10 | 174802.6201 | -882.6201184 |




**4.1** Write down the regression equation for the above data? [4 marks]

4.2 Carefully study the regression output above and interpret the below results?

a) What does the normal probability plot/ scatterplot indicate? [1 mark]
b) R square [5 marks]
c) Significance F [5 marks]
d) Coefficients [5 marks]
e) Residuals output [5 marks]

**Section B subtotal: 70 marks**

**GRAND TOTAL: 100 MARKS**