QUALIFICATION : **BACHELOR of SCIENCE IN APPLIED MATHEMATICS AND STATISTICS**	
QUALIFICATION CODE: **07BSAM**	LEVEL: **6**
COURSE: **APPLIED MATHEMATICAL AND STATISTICAL COMPUTING**	COURSE CODE: **AMS602S**
DATE: **JANUARY 2025**	SESSION: **1**
DURATION: **3 HOURS**	MARKS: **100**

SECOND OPPORTUNITY / SUPPLEMENTARY: EXAMINATION QUESTION PAPER

EXAMINER:	*Mr. Jan Johannes Swartz*
MODERATOR:	*Mr. Simon Kashihalwa*

INSTRUCTIONS:
1. Answer all the questions using MATLAB R2007b and IBM SPSS Statistics 29 software on your computer into the z-drive
2. Create a MS Word document in your z-drive on your computer. Copy your results from MATLAB R2007b and IBM SPSS Statistics 29 in the MS Word document and save the MS Word file containing your student number, e.g. 2001349.
3. No books, notes and other additional aids are allowed.
4. Mark all answers clearly with their respective question numbers.

PERMISSIBLE MATERIALS:

1. Computer with MATLAB R2007b, IBM SPSS Statistics 28 and MS Office software

ATTACHEMENTS

1. None

This paper consists of 6 pages including this front page

Use **MATLAB R2007b**, installed in your computer, to answer the following questions.

Question 1 [25 marks]

1.1 Suppose n is a column vector, where n = (0:7)'. Build in MATLAB a table of squares and powers of 2. [3]

1.2 Let x = (1:0.1:2)' and build a table of logarithms in MATLAB. [2]

1.3 Let x = 0:0.05:5 and y = sin (x. ^2), produce an XY plot and suppose x = 0:0.1:4 and

y = sin (x. ^2).*exp (-x). Produce a stem plot of x and y. [4]

1.4 Create a magic square matrix E of size 6, find the sum and the transpose of the matrix of E. [6]

1.5 Consider a data set with the following three variables:

- Heart rate, first column
- Weight, second column
- Hours of exercise per week, third column

For 5 observations from patients, the resulting array D of the variables is given below:

D = [72 134 3.2
81 201 3.5
69 156 7.1
82 148 2.4
75 170 1.2]

1.5.1 Obtain the range, mean, variance and standard deviation of each variable (Heart rate, Weight and Hours of exercise per week). [10]

Question 2 [25 marks]

Type the following data in a notepad file, safe the file as a text file and name it as **studentnoQ2.txt**. Import the data file in MATLAB. Save the text file in your folder in the z-drive. [4]

Age	Salary	Age of oldest person	Staying on campus will improve my results	Sleeping more hours will improve results
19	20000	97	2	3
28	45000	102	4	2
22	72000	96	4	1
21	45000	121	5	2
21	48000	93	1	2
20	49000	99	3	4
25	15000	140	2	4
21	18000	60	4	4
21	20000	67	2	2
20	20000	98	1	1
20	20000	92	4	2
19	65000	102	4	4
26	10000	100	5	1
27	15000	96	4	1
22	18000	98	4	1
24	45000	75	5	3

Create an **M-File in MATLAB** and write a pseudocode to answer the questions below. Save your m-file as **studentnoQ2.m**. in your folder in the z-drive. [4]

2.1 Determine the mean, median, mode, range, variance and standard deviation of the variables; age, salary and age of oldest person. [6]

2.2 Display the shape of the distribution of salary and age in the form of a histogram with legends and their exponential fit. [5]

2.3 Find the covariance of age and salary, the correlation coefficient and the correlation of determination. [6]

Question 3 [25 marks]

Use **IBM SPSS Statistics 29**, installed in your computer, to answer the following questions.

The Centre for Entrepreneur Development (CED) hired students to do in-home care for elderly people at the Senior Park in Pioneers Park, Windhoek so that they can remain independent and stay in their homes as long as possible. The students do cleaning, yard work, shopping, etc. The staff at the Senior Park begins by interviewing the seniors in their homes and assessing their need for services. The information is used to match the seniors with the students who want employment:

The following variables were used to collect data about the elderly people:

- Age at last birthday ("age"):
- Sex of respondent ("sex"):
  1 = Male

  2 = Female

- Lives alone ("alone"):
  1=Yes

  2=No

- Low income ("lowincome"):
  1 = Yes, Eligible for Supplemental Security Income (SSI),

  2 = No, Not Eligible for Supplemental Security Income (SSI)

- Need for assistance with the activities of daily living ("ADL"):
  1 = Bathing

  2 = Dressing

  3 = Toileting

  4 = Transferring in/out of bed

  5 = Eating

- Total number of ADLs needing help: Need for assistance with the instrumental activities of daily living ("IADL"):
  1=Using telephone

  2=Shopping

  3=Preparing food

  4=Light housework

  5=Heavy housework

  6=Finances

- Systolic Blood Pressure (SBP)

To keep track of the needs of potential clients, the program created a data file from one month's new applications. Use the data file, called **Jan_exam_data**, saved on the desktop of your computer and answer the following questions.

3.1 Import the data from your Excel file, **Jan_exam_data** into SPSS and define all the variables in SPSS. Save your SPSS data file using your initials and student number, eg. **studentnoQ3**. [5]

3.2 Recode the variable "age" into "agegroup" using the following categories:

$1 = 60\text{-}69$ yrs

$2 = 70\text{-}79$ yrs

$3 = 80+$ yrs

Run a frequency of the variable "agegroup". [2]

3.3 Obtain summary information about the distribution, variability, and central tendency of the continuous variables, "age". Furthermore, visually examine the central tendency and distributional characteristics of the continuous variable, "age" as well as producing a histogram, stem and leaf and box plots and checking assumptions with Normality plots. Write up a short narrative for each output explaining what you found about this variable (age). [14]

3.4 Produce a table of frequencies and percentages and a bar chart of the variable "sex". Write up a short narrative explaining your results. [4]

QUESTION 4 (25 MARKS)

4.1 Perform a simple linear regression of the variables "SBP" (dependent variable) and "age" (independent variable) and show the results. [6]

4.2 State the regression equation and interpret the equation in terms of age and systolic blood pressure. [5]

4.3 How much of the variation in systolic blood pressure is explained by the differences in age? [2]

4.4 Is the regression line significant? State your hypothesis and the p-value. [5]

4.5 Is there a significant difference in men and woman in terms of average systolic blood pressure in the population? State the null and alternative hypothesis. Run an appropriate statistical test to test the hypothesis. Write a short narrative explaining your results.   [7]

**************************END OF EXAMINATION****************************