



PAMIBIA UNIVERSITY
OF SCIENCE AND TECHNOLOGY
FACULTY OF HEALTH AND APPLIED SCIENCES

DEPARTMENT OF MATHEMATICS AND STATISTICS

QUALIFICATION: BACHELOR OF SCIENCES APPLIED MATHEMATICS AND STATISTICS	
QUALIFICATION CODE: 07BAMS	LEVEL: 6
COURSE CODE: AMS602S	COURSE: APPLIED MATHEMATICAL AND STATISTICAL COMPUTING
SESSION: JANUARY 2020	PAPER : THEORY
DURATION: 3 Hours	MARKS: 100

SUPPLEMENTARY/SECOND OPPORTUNITY EXAMINATION QUESTION PAPER	
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INSTRUCTIONS	
1.	Answer all the questions using MATLAB R2007b and IBM SPSS Statistics 25 software on your computer
2.	Create a folder with your student number and your name on the desktop, e.g. 2001349_jjswartz
3.	Copy your results from MATLAB R2007b and IBM SPSS Statistics 25 in a MS Word document and save the word file in your folder containing your student number and your name, e.g. 2001349_jjswartz .
4.	Copy your folder with its content into the z-drive.

PERMISSIBLE MATERIALS

1. Computer with MATLAB R2007b, IBM SPSS Statistics 25 and MS Office software

THIS QUESTION PAPER CONSISTS OF 4 PAGES (Including this front page)

QUESTION 1 [25 MARKS]

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

1.1. Create a 4x4 matrix, called A, that has 1's in the first row, 2's in the second row, 3's in the third row and 4's in the fourth row. [2]

1.2. Produce a 4x4 matrices of Zero's and call it B, and ones and call it C. Produce a matrix of the product of C and A in (1.1) above and call it D. Provide the square root of D. [5]

1.3. Create a magic square matrix E of size 6, find the sum and the transpose of the matrix of E. [4]

1.4. Plot, on the same figure, the two functions below:

$$f = 3t^2 + 2t - 0.5$$

$$g = 2t \cos(t)$$

where the variable t varies from 0 to 10 with step 0.5. Draw the function f in blue \circ and the function g in red $*$. Give a title to your graph and label the axes. [7]

1.5. Let [7]

$$A = \begin{bmatrix} 11 & -2 & 3 \\ 4 & 0 & 4 \\ 1 & 9 & 5 \end{bmatrix}; \quad B = \begin{bmatrix} 1 \\ 0 \\ -1 \end{bmatrix}; \quad C = \begin{bmatrix} -5 & 12 & 4 \\ 3 & -6 & 2 \end{bmatrix}; \quad D = \begin{bmatrix} 5 & -2 & 0 \\ 8 & 7 & 6 \end{bmatrix};$$

$$E = [1 \ 3 \ 5 \ 7 \ 6 \ 8 \ 0 \ 9 \ 4 \ 2]$$

1.5.1. Multiply matrix C and D [Hadamard product].

1.5.2. Arrange the elements of the vector E in ascending order.

1.5.3. Return the smallest element of vector E.

1.5.4. Delete 2nd column from matrix C.

1.5.5. Use Left division to solve $X = A^{-1}B$

QUESTION 2 [25 MARKS]

Type the following data in a notepad file, save 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 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 [28 MARKS]

Use **IBM SPSS Statistics 25**, 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**. [10]

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

- 1 = 60-69 yrs
- 2 = 70-79 yrs
- 3 = 80+ yrs

Define the variable with labels and produce a frequency of the variable "agegroup" and interpret your results. [6]

3.3 Produce a table of frequencies and percentages and a bar chart of the variable "sex". Write up a short narrative explaining your results. [6]

3.4. Find the correlation coefficient between Systolic Blood Pressure (SBP) and Age at last birthday ("age"). Interpret your results. [6]

QUESTION 4 (22 MARKS)

4.1 What is the mean age and mean SBP of the 30 people? [2]

4.2 Carry out a simple linear regression of SBP as the dependent variable and age as the independent variable and show the results? [7]

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

4.4 How much of the variation in systolic blood pressure is explained by the differences in age? [3]

4.5 Use One-Way Analysis of Variance to compare the mean age of females and males? [5]

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