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Bastion of Knowledge...

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**OFFICE OF THE DEPUTY PRINCIPAL
ACADEMICS, STUDENT AFFAIRS AND RESEARCH**

UNIVERSITY EXAMINATIONS

2020 /2021 ACADEMIC YEAR

THIRD YEAR FIRST SEMESTER REGULAR EXAMINATION

**FOR THE DEGREE OF BACHELOR OF SCIENCE (APPLIED STATISTICS WITH
COMPUTING)**

COURSE CODE: STA 318

COURSE TITLE: COMPUTING METHODS AND DATA ANALYSIS

DATE: 9/03/2021 TIME: 1400 – 1700 HRS

INSTRUCTION TO CANDIDATES

- SEE INSIDE

THIS PAPER CONSISTS OF 5 PRINTED PAGES

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REGULAR – MAIN EXAM

STA 318: COMPUTING METHODS AND DATA ANALYSIS

STREAM: ASC

DURATION: 3 Hours

INSTRUCTION TO CANDIDATES

Answer **ALL** questions from section A and any **THREE** from section B.

SECTION A [31 Marks]. Answer ALL questions.

QUESTION ONE [15 Marks]

- a) Define clearly the following terms. [4 Marks]
 - i) Descriptive statistics
 - ii) Case study.
 - iii) Missing values.
 - iv) Outliers.
- b) Distinguish between nominal and ordinal types of data. [2 Marks]
- c) Why is sample survey preferred as compared to carrying census? [2 Marks]
- d) Give three objectives of data management process in a research project. [3 Marks]
- e) Identify and describe briefly two major sources of data. [4 Marks]

QUESTION TWO [16 Marks]

- a) State two advantages of using other statistical packages other than MS Excel. [2 Marks]
- b) Write and describe clearly procedure and R codes used to read data from file in MS Excel into R and perform descriptive statistics of variables. Assume file name is "Family_Income.xlsx" and located on folder I:\Research_Project. [4 Marks]
- c) Elaborate the term data cleaning. [3 Marks]
- d) What is the difference between a database and a spread sheet? [2 Marks]
- e) In an investigation to determine the risk of developing cancer amongst males and females in a certain locality, the following data was recorded.

Gender	Developed Cancer	
	Yes	No
Male	7	240
Female	4	734

Test whether there exists any association between gender and risk of developing cancer ($\alpha = 0.05$). [5 Marks]

SECTION B [39 Marks] Answer any THREE questions]

QUESTION THREE [13 Marks]

- a) Discuss the basic principles required in designing a good questionnaire. [4 Marks]
 b) Consider the R output below on life expectancy at birth for ten countries with the following variables, average life expectancy at birth (l_exp), number of people per television set (per_tel), number of people physician (per_phy), female life expectancy (f_l_exp), male life expectancy (m_l_exp) and difference between female and male life expectancy(d_exp)

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RStudio
File Edit Code View Plots Session Build Debug Profile Tools Help
Go to file/function Addins
Source
Console ~/
> table1
  country l_exp per_tel per_phy f_l_exp m_l_exp d_exp
1 Argentina 70.5    4.0    370    74    67    7
2 Bangladesh 53.5   315.0  6166    53    54   -1
3 Brazil 65.0    4.0    684    68    62    6
4 Canada 76.5    1.7    449    80    73    7
5 China 70.0    8.0    643    72    68    4
6 Colombia 71.0    5.6   1551    74    68    6
7 Egypt 60.5   15.0    616    61    60    1
8 Ethiopia 51.5   503.0   660    53    50    3
9 France 78.0    2.6    403    82    74    8
10 Germany 76.0    2.6    346    79    73    6
    
```

Write commands with brief explanations that would;

- i) Assign the country's names to the 'names' attribute of this vector. Also create a vector 'l_exp', 'per_tel', 'per_phy', 'f_l_exp', 'm_l_exp'. [2 Marks]
 ii) Bind all the variables in i) above [2 Marks]
 iii) Create d_exp, the difference between female and male life expectancy. [2 Marks]
 iv) Generate output above, sort and descriptive statistics [3 Marks]

QUESTION FOUR [13 Marks]

- a) What is a scatter diagram? What does it show? [3 Marks]
 b) A study was conducted to find out whether there is any relationship between the weight and blood pressure of an individual. The following set of data was arrived at from a clinical study.

Weight	78	86	72	82	80	86	84	89
Blood pressure	140	160	134	144	180	176	174	178

- i) Sketch a scatter diagram and make the necessary comments. [4 Marks]
 ii) Describe procedure you would use to plot the scatter diagram above in SPSS. [6 Marks]

QUESTION FIVE [13 Marks]

- a) Why is Analysis of Variance (ANOVA) usually preferred than t – test? [2 Marks]
- b) A survey was conducted to find out whether students prefer a particular type of music than the other: Classical, Rock, Pop and Jazz. Sixty students were randomly selected and asked to rate the one particular type on music, the following results were obtained. $MSS_{TR} = 9530$ and $MSS_E = 252$
- i) Write H_0 and H_1 [2 Marks]
- ii) Sketch an ANOVA table with all the parameters. [3 Marks]
- c) An experiment was conducted on muzzle velocities and the following data from four different types of powder brands (A, B, C and D) were obtained. ($\alpha = 0.05$).

	A	B	C	D
1	Brand A	Brand B	Brand C	Brand D
2	2.3	2.4	2.1	2.7
3	2.5	2.2	2.3	2.6
4	2.4	2	2.5	2.5

Describe the procedure including codes how you would use to perform ANOVA in R. [6 Marks]

QUESTION SIX [13 Marks]

- a) A researcher wanted to explore there are gender differences in engagement in out-of-school science activities. The variable SCIEACT is a score derived from responses to nine items on how often the student engages in particular science activity, such as watching TV programme about science and attending science club.

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
SCIEACT	20	3.50	1.573	1	7
Gender	20	1.70	.470	1	2

Mann-Whitney Test

Ranks

	Gender	N	Mean Rank	Sum of Ranks
SCIEACT	Male	6	8.33	50.00
	Female	14	11.43	160.00
	Total	20		

Test Statistics^a

	SCIEACT
Mann-Whitney U	29.000
Wilcoxon W	50.000
Z	-1.100
Asymp. Sig. (2-tailed)	.271
Exact Sig. [2*(1-tailed Sig.)]	.312 ^b

a. Grouping Variable: Gender
 b. Not corrected for ties.

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- i) Write procedure used to perform the test that produces the output above [5 marks]
 - ii) State the hypothesis for the test [2 marks]
- b) Write a brief report about the results and make appropriate conclusions [6 marks]

QUESTION SEVEN [13 Marks]

- a) i) State and discuss the steps followed when carrying out simplex algorithm. [5 Marks]
- ii) A furniture makes desks, tables, and chairs. Each product needs the limited resources of lumber, carpentry and finishing; as described in the table. At most 5 tables can be sold per week

Resource	Desk	Table	Chair	Max available
Lumber (board feet)	8	6	1	48
Finishing hours	4	2	1.5	20
Carpentry hours	2	1.5	0.5	8
Max demand	Unlimited	5	Unlimited	
Price (\$)	60	30	20	

Formulate a linear programming (LP) model. [3 Marks]

- b) The table below shows data on weight gained in grams by patients from two different health facilities.

Patient P	1003.8	905.8	1011.4	690.2	1086.2	1001.07	1302.3	595.2
Patient Q	303.5	1103.4	1515.3	1522.2	581.7	506.8		

- i) Write an R code to test whether the distribution of weights gained by patients in the two health facilities is the same or not using Mann-Whitney U test($\alpha = 0.05$) [3 Marks]
- ii) Assume that from analysis output you get a p-value of 0.0047, what do you conclude? [2 Marks]