MAASAI MARA UNIVERSITY

REGULAR UNIVERSITY EXAMINATIONS
2023/2024 ACADEMIC YEAR
FOURTH YEAR FIRST SEMESTER

SCHOOL OF BUSINESS AND ECONOMICS BACHELOR OF SCIENCES IN FINANCIAL ECONOMICS), BACHELOR OF SCIENCES IN ECONOMICS AND STATISTICS, BACHELOR OF SCIENCES IN ECONOMICS, BACHELOR OF AGRICULTURAL ECONOMICS, AND BACHELOR OF ARTS IN AGRICULTURAL ECONOMICS

COURSE CODE: ECO 4106-1

COURSE TITLE: DATA ANALYSIS AND COMPUTER APPLICATIONS IN ECONOMICS

DATE: 15/12/2023   TIME: 0830-1030 HRS

QUESTION ONE (20 MARKS)

a) To assess the impact of oral contraceptive use (contr_usage) on bone mineral density (bmd) among female postgraduate students at Maasai Mara University, researchers carried out a study comparing bmd for students who had used oral contraceptives for at least 3 months (use_cont) to bmd for students who had never used oral contraceptives (nuse_con). Data was collected from 52 and 22 students who had used and who had never used contraceptives for at least three months respectively. A two-sample t-test for the difference in the bmd is between the 2 groups is given as follows:

```
. ttest bmd, by(contr_usage)

Two-sample t test with equal variances
  ---------------------------------------------------------------------
   Group |     Obs       Mean     Std. Err.   Std. Dev.   [95% Conf. Interval]
  ---------+-----------------------------------------------------------
 nuse_con |      52    2.249046    .1590708   1.147076
 use_cont |      22    2.364697    .2070349   .9710796   1.934144    2.79525
  ---------+-----------------------------------------------------------
 combined |      74    2.283428    .1269896   1.092406   2.030339    2.536518
  ---------+-----------------------------------------------------------
    diff |           -.1156514    .2794255             -.6726759    .4413731
  ---------------------------------------------------------------------
    diff = mean(nuse_con) - mean(use_cont)                    t =   -0.4139
 Ho: diff = 0                                   degrees of freedom =       72

   Ha: diff < 0                 Ha: diff != 0                   Ha: diff > 0
 Pr(T < t) = 0.3401        Pr(|T| > |t|) = 0.6802          Pr(T > t) = 0.6599
```

   i) Clearly state the null hypothesis being tested here (1 mark)

   ii) Compute the confidence interval of the mean bone mineral density for the group that had not used it for at least three months. (2 marks)

   iii) A columnist in the University's Monthly Article (*Mara Monthly*) claimed that the use of oral contraceptives has resulted in higher bone mineral density among the users than the non-users. React to this claim given the results above. (2 marks)

   iv) Compute the standard error for the mean bone mineral density for groups that use oral contraceptives. (1 mark)

   v) Interpret the mean bone mineral density for the users and nonusers of oral contraceptives. (2 marks)

   vi) Give any 2 challenges that you may encounter when conducting this kind of research among the university students. (4 marks)

b) Chi-Homes is a property-selling company with 74 sales and marketing staff. The staff use random phone calls to reach out to potential clients. Because of the high calling tariff rates, Chi-Homes has negotiated a calling contract with Zhi-Tel (a mobile service provider). The negotiated tariff is given in the Table below.

Call minutes per week per staff	Tariff Rates in Zhioids (Zhioids is the currency in which the calling contract is made)
0-112	100
113-172	95
173-225	85
>225	65

In a the first week of the contract, Chi-Homes summarized the calls by its staff and presented them in a stem-and-leaf diagram below.

```
1** | 13,14
1** | 26,29,31,31,32,34,36,37,38,38
1** | 40,41,41,44,44,44,45,48,51,53,53,54,55,55,55,56,58
1** | 60,62,63,63,64,66,69,70,75,76,78,79
1** | 80,85,86,97,97
2** | 00,00,00,03,03,13,15,17,17,19
2** | 24,36
2** | 46
2** | 70
2** | 80
3** | 04
3** | 34,36
3** | 58,58
3** | 93,96
4** | 14
4** | 48
4** | 64,69
5** | 00
5** | 48
```

i) Compute the company's call expenditure on the employees who made (3 marks) calls for 170-201 minutes in the first week.

ii) Suppose a further negotiation is made between Chi-Homes and Zhi-Tel (3 marks) that minutes above 200 per week would attract a discount of 10%, how much would Chi-Homes save due to this discount from the calls made by the employees who made calls between 187 and 358 minutes in the week?

iii) Explain any 1 demerit of using the stem-and-leaf display to present data. (2 marks)

QUESTION TWO (15 MARKS)

a) A law firm has been asked to represent a group of women who charge that their employer (Gangre Chemicals Ltd.) discriminates against them, especially in pay. The women claim that salary increases for females are consistently and considerably lower than the raises men receive. Gangre Chemicals counters that increases are based entirely on job performance as measured by an impartial "supervisor rating of work" evaluation which includes a number of performance indicators. You have been asked by the law firm to make a preliminary assessment of the merits of the claim. To begin with, you draw a random sample from the company's files and collect data on Sex (male or female), Quality of Work Score, Years of Experience, and Salary Increase. Sex is coded as 0=Female and Salary Increase is measured in extra dollars per month.

You run a multiple regression of Salary Increase (sal_inc) on Employee Sex (emp_sex), Work Quality (work_qlty), and Years of Experience (years_exper). The results are presented below.

```
. reg sal_inc emp_sex work_qlty years_exper

      Source |       SS           df       MS      Number of obs   =        74
-------------+----------------------------------   F(3, 70)        =      6.49
       Model |  164264.853          3  54754.9511   Prob > F        =    0.0006
    Residual |  590866.431         70  8440.94902   R-squared       =    0.2175
-------------+----------------------------------   Adj R-squared   =    0.1840
       Total |  755131.284         73  10344.2642   Root MSE        =    91.875


------------------------------------------------------------------------------
     sal_inc |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
```

3

```
    emp_sex |   -88.28873    30.1388   -2.93   0.005   -148.3987   -28.17879
  work_qlty |    7.681059    2.72673    2.82   0.006    2.242768    13.11935
years_exper |    6.716813   4.720751    1.42   0.159   -2.698427    16.13205
      _cons |   -198.0991   117.5729   -1.68   0.096   -432.5909    36.39262
------------------------------------------------------------------------------
```

i) Is the discrimination in pay increase claim by the women valid? Give a reason for your response. (2 marks)

ii) Interpret the coefficients of *work_qlty*, *years_exper*, and the regression constant. (3 marks)

iii) Sketch the normal curve for the $years_{exper}$ variable. Label the coefficient and the lower and upper confidence intervals. (2 marks)

iv) A parallelly done research gave the coefficient of *emp_sex* as 0.54. Is this finding contradicting the findings above? Explain. (2 marks)

b) The following is a summary of French bean prices (in Kenya Shillings per ton) in Muthurwa Market for the 48 days ending July 11, 2023.

```
. sum fb_price, detail

                          fb_price
-------------------------------------------------------------
       Percentiles       Smallest
 1%      300.2667        300.2667
 5%      305.9333        301.0667
10%      313.1333        305.9333      Obs                48
25%      339.4333           309.8      Sum of Wgt.        48

50%      392.8333                      Mean          487.5208
                          Largest      Std. Dev.     206.8523
75%         616.8        897.7333
90%           866        906.2667      Variance      42787.87
95%      906.2667        966.6667      Skewness      1.231316
99%         1060.4                     1060.4        Kurtosis
3.318118
```

i) Is the data on the French bean prices normally distributed? Give a reason for your answer. (2 marks)

ii) Characterize the type of Kurtosis of the distribution. (2 marks)

iii) What is the confidence interval for the French bean prices for the given period? (2 marks)

QUESTION THREE (15 MARKS)

a) Give any (5) benefits that a researcher gets if she opts to collect secondary data as opposed to secondary. (5 marks)

b) You are planning to conduct a study in Kakamega County to establish the preferences of potato farmers of a certain fertilizer type. Explain the five (5) steps you would take to conduct this research. (10 marks)

QUESTION FOUR (15 MARKS)

a) The County Government of Narok is planning to dispose of some trucks it acquired in 2012. As a brokerage agent who is interested in negotiating the prices, you choose to run a correlation between the truck price (truck_price) and kilometer per liter (kmpl), number of repairs since 2016 (num_rep2016), tonnage (ton), and the tare weight (tweight). The correlation output is given below.

```
. correlate truck_price kmpl num_rep2016 ton tweight
(obs=69)

             | truck_price kmpl num_rep2016 ton    tweight
-------------+--------------------------------------------
 truck_price |   1.0000
        kmpl |  -0.4559    1.0000
 num_rep2016 |   0.0066    0.4023    1.0000
         ton |   0.3232   -0.5798   -0.1572    1.0000
     tweight |   0.5478   -0.8055   -0.4003    0.6691    1.0000
```

    i)   Interpret the correlation coefficients for the 4 variables (kilometer per liter, number of repairs since 2016, tonnage, and tare weight); showing if they are strongly correlated, moderately correlated, or weakly correlated. (8 marks)

    ii)   Write short notes on why the price of the trucks would have a negative relationship with the kilometer per liter. (3 marks)

b) With examples, explain the following terms:

    i)   A discrete variable (2 marks)

    ii)   Univariate dataset (2 marks)

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