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**JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY**

**SCHOOL OF MATHEMATICS AND ACTURIAL SCIENCE**

**UNIVERSITY EXAMINATION FOR DEGREE OF BACHELOR OF SCIENCE ACTUARIAL**

**1st Year 1st SEMESTER 2015/2016 ACADEMIC YEAR**

**MAIN REGULAR**

**COURSE CODE: SAS 804**

**COURSE TITLE: TEST OF HYPOTHESIS**

**EXAM VENUE: STREAM: (MScApplied Statistics)**

DATE: EXAM SESSION:

TIME: 2.00 HOURS

**Instructions:**

1. **Answer any three questions.**
2. **Candidates are advised not to write on the question paper.**
3. **Candidates must hand in their answer booklets to the invigilator while in the examination room.**

**QUESTION ONE (20 Marks)**

1. In an epidemic of gastroenteritis in an area the number of cases reported in two populations consuming water from different sources were as follows:

|  |  |  |
| --- | --- | --- |
| Source of variation |  Number of people consuming water from the source | Number of cases of gastroenteritis |
| Tap water | 800 | 35 |
| Hand pump | 2400 | 120 |
| Total | 3200 | 155 |

Teststatistical difference in the proportion of cases in the two groups is significantly different at 95% confidence level. (10 marks)

1. In an experiment to know whether there is statistical difference in the length of small intestines between males and females, the observations recorded were as follows:

|  |  |  |
| --- | --- | --- |
|  | Males | Females |
| Number of observations | 17 | 15 |
| Mean length of the small intestines | 157 units | 146 units |
| Standard deviations of the observations | 34 units | 1. units
 |

Evaluatestatistical difference between the lengths of small intestines between the two sex groups using an appropriate test at 95% confidence level. (10marks)

**QUESTION TWO (20 Marks)**

Iron intake of antenatal mothers in different periods of pregnancy in 10 villages is provided below.

|  |  |  |
| --- | --- | --- |
| Antenatal period (Trimester) | Villages | Total of each trimester |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| I | 11.5 | 19.5 | 18.5 | 12.5 | 18.5 | 16.5 | 26.5 | 18.5 | 16.5 | 24.5 | 182.5 |
| II | 27.0 | 28.0 | 22.0 | 21.0 | 15.0 | 19.5 | 20.0 | 26.0 | 30.0 | 28.5 | 237.0 |
| III | 28.0 | 30.0 | 26.0 | 30.0 | 24.5 | 28.5 | 26.0 | 30.0 | 27.0 | 25.5 | 275.5 |
| Total of village | 66.5 | 77.5 | 66.5 | 63.5 | 58.0 | 64.5 | 72.5 | 74.5 | 73.0 | 78.5 | 695.0 |

Test the hypothesis that the iron intake in the different periods is significantly not different at 95% confidence level. (20 marks)

**QUESTION THREE (20 Marks)**

 The following data gives the age of the mother in years at the time of delivery and weight of the new born in sample deliveries.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Age of the mother ($x\_{1}$) | 25 | 36 | 25 | 28 | 30 | 22 | 35 | 30 | 21 | 20 | 41 | 35 | 20 | 20 | 20 |
| Weight of the new born in Ibs ($x\_{2}$) | 5.0 | 8.0 | 7.0 | 7.5 | 7.5 | 6.0 | 7.0 | 7.0 | 5.2 | 6.1 | 8.0 | 7.0 | 7.0 | 4.5 | 4.0 |

1. Quantify the relationship between the two variables age of the mother ($x\_{1}$) and weight of the new born ($x\_{2}$) using parametric correlation analysis. (4 marks)
2. Fit a regression line for the data hence provide the regression equation. (6 marks)
3. Interpret the regression coefficients (2 marks)
4. Test for the statistical significance of the regression coefficients at 95% confidence level. (4 marks)
5. Obtain an ANOVA table for the fitted regression model. (6 marks)

**QUESTION FOUR (20 Marks)**

(a) In a filariasis survey, the number of people with and without filariasis infestation in the two sex groups were as follows:

|  |  |  |  |
| --- | --- | --- | --- |
| filariasis infestation | Male | Female | Total |
| Yes | 28 | 20 | 48 |
| No | 237 | 222 | 459 |
| Total | 265 | 242 | 507 |

Test whether the prevalence of filariasis has statistical association with the sex using an appropriate test at 95% confidence level. (10 marks)

(b) If the number of boys and girls who are regular in their exercises is distributed as given below, it is required to test whether there is statistical difference in the exercise habits between boys and girls.

|  |  |  |  |
| --- | --- | --- | --- |
| Habit | Boys | Girls | Total |
| Exercise regularly | 2 | 8 | 10 |
| Do not exercise regularly | 10 | 4 | 14 |
| Total | 12 | 12 | 24 |

Use an appropriate Chi-square test to assess whether exercise regularly is associated with sex at 95% confidence level. (10 marks)

**QUESTION FIVE (20 Marks)**

Suppose that we are interested in the factors thatinfluence whether a political candidate wins an election. The outcome (response) variable is binary (1/0) for win /lose. The predictor variables of interest are the amount of money spent on the campaign ($x\_{1}$), the amount of time spent campaigning negatively ($x\_{2}$) and whether or not the candidate is incumbent ($x\_{3}$). The regression coefficients are provided below;

|  |  |  |
| --- | --- | --- |
| $$x\_{1}$$ | = | 0.8040 |
| $$x\_{2}$$ | = | -0.6754 |
| $$x\_{3}$$ | = | 0.0226 |
| Null deviance | = | 499.98 |
| Residual deviance | = | 358,52 |

1. Write the logistic regression formula and interpret the regression coefficients. (4 marks)
2. Obtain the odds ratio for the regression coefficients showing clearly your working formula. (6 marks)
3. Interpret the odds ratio. Also, compare performance of incumbent and non-incumbent using the odds ratio. (6 marks)
4. Obtain pseudo-R squared and use it to evaluate the model goodness-of-fit interpreting accordingly. (4 marks)