



**UNIVERSITY EXAMINATIONS**

**THIRD YEAR EXAMINATION FOR THE AWARD OF DEGREE OF  
BACHELOR OF SCIENCE (ECONOMICS & STATISTICS)**

**MATH 346: APPLIED STATISTICS**

**STREAM: ECON & STAT Y3S**

**TIME: 2 HOURS**

**DAY/DATE: TUESDAY 18/12/2012**

**8.30 A.M. – 10.30 A.M**

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**INSTRUCTIONS:**

**Answer question one and any other two**

**Question 1 (30 Marks)**

- (a) Differentiate between the following terms;
- (i) Sampling distribution and probability distribution of a variable.
  - (ii) Type 1 and type 11 error
  - (iii) One tailed test and two tailed test. [6 Marks]
- (b) State and explain the basic principles of experimental designs. [4 Marks]
- (c) Differentiate between simple random sampling and convenient sampling. [5 Marks]
- (d) State the major steps in testing a hypothesis. [3 Marks]
- (e) State and explain the major differences between:
- (i) Kruskal Wallis H. test and sign test. [4 Marks]
  - (ii) Mann Whitney test and chin square test. [4 Marks]

- (f) Explain the meaning of mean square error and standard error as used in multiple regression model. [4 Marks]

**Question Two (20 Marks)**

Breast cancer is emerging to be a major threat to the population in Kenya. It is also emerging that the disease affects both male and female. A chukka nursing student has interviewed a number of residents of Nithi village about their cancer status and present s the following data.

Breast cancer status	Gender	
	Male	Female
Positive	40	70
Negative	60	50
Unknown	120	40

You are required to:

- (a) At the 5% level of significance, determine if cancer status is independent of gender. [10 Marks]
- (b) Four treatments were compared using a completely randomized design. The data is as shown in the table below.

Treatments			
1	2	3	4
124	147	141	117
167	121	144	128
135	136	139	102
160	114	162	119
159	129	155	128
144	117	150	123
133	109		

Does the data provide sufficient evidence to indicate a difference in location from at least two of the population? Test using the Kruskal – Wallis H statistic, with  $\alpha = 0.05$ . [10 Marks]

**Question Three (20 Marks)**

The issue of income distribution in Kenya is being debated in the wake of the proposed devolved system of governance. Momanyi has obtained income data for 9 residents in each of the 4 counties of interest to him. The data is presented in the table below. Perform an ANOVA test at 5% significance to determine if the mean income in the 4 counties is equal. [20 Marks]

Nyeri	Kakamega	Kisumu	Garissa
34	45	20	12
45	34	25	109
67	42	34	39
56	24	57	49
89	45	88	38
32	90	47	26
12	23	34	22
23	78	32	45
65	18	20	20

**Question Four (20 Marks)**

(a) From the set of data given below

$X_i$	28.0	28.0	32.5	39.0	45.9	57.8	58.1	62.5
$Y_i$	12.4	11.7	12.4	10.8	9.4	9.5	8.0	7.5

(i) Compute the least square estimates of the regression parameters  $\beta_0$  and  $\beta_1$ .  
[8 Marks]

(ii) Test the hypothesis  $H_0: \beta_1 = 0$  vs  $H_1: \beta_1 \neq 0$  at 5% level of significance.  
[6 Marks]

(b) The average time before the gear train of a certain make of automobile needs a major overhaul is 56 months, with a standard deviation of 16 months. The manufacturer wishes to warranty these gear trains, offering to make any necessary overhaul free of charge if the buyer of a new automobile has a gear-train breakdown before a certain number of months of ownership have elapsed. Assume that the number of months before an overhaul is required is normally distributed. For how many months should the manufacturer warrant the gear trains to limit the number of warranty overhaul, to no more than 2.28% of the automobiles sold?  
[6 Marks]

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