

KENYA METHODIST UNIVERSITY
END OF SECOND TRIMESTER 2006/2007 EXAMINATIONS

FACULTY : **SCIENCES**
DEPARTMENT : **MATHEMATICS AND COMPUTER SCIENCE**
COURSE CODE : **MATH 231**
COURSE TITLE : **BIOSTATISTICS**
TIME : **3 HRS**

Instructions:

- Answer question 1 (compulsory) and any other 2 questions.

Question 1

- a) Two horses A and B were tested according to the time taken (in seconds) to run round a particular track. The results are shown below

Horse A	28	30	32	33	33	29	34
Horse B	29	30	30	24	27	29	

Construct a 95% confidence interval for the difference between their true population mean times in completing the track. (6 mks)

- b) The following frequency distribution shows the resting systolic blood pressure of 35 patients.

Blood pressure (mmHg)	115-124	125-134	135-144	145-154	155-164
Number of patients	4	5	5	7	5

Blood pressure (mmHg)	165-174	175-184
Number of patients	4	5

Construct the following diagrams to represent the data:

- i) Histogram
 - ii) Ogive
- c) The number of cases of tetanus reported in Kenya during a single month in 2004 has a Poisson distribution with parameter 4.5. Calculate the probability that:
- i) Almost two cases of tetanus will be reported in a month.
 - ii) At least three cases of tetanus will be reported in a month. (6 mks)
- d) Explain briefly the following:
- i) Survival function
 - ii) Normal distribution
 - iii) Type I and Type II errors (6 mks)
- e) Briefly explain the steps that are followed in testing of hypothesis. (5 mks)

Question 2

- a) For the purpose of calculating the dosage for a certain disease, a doctor uses the normal distribution for adult patients with the mean 150 and standard deviation 20 pounds. Calculate the:
- i) Proportion of patients that weigh less than 235 pounds.
 - ii) Proportion of patients that weigh between 166 and 189 pounds.
 - iii) Weighs between which the middle 95% of the adult patients fall. (12 mks)
- b) i) Define the following terms; sensitivity and specificity of the test.
- ii) List four methods of sampling. (8 mks)

Question 3

- a) Computer response time is defined as the length of time a user has to wait for the computer to access information on the disk. Suppose a data centre wants to compare the average response times of its

computer disk drives. Independent random samples of 13 response times for disk 1 and 15 for disk 2 were selected (in ms)

DISK 1				DISK 2			
59	73	74	61	71	53	40	34
92	60	84		38	48	60	75
54	73	47		47	41	44	86
102	75	33		53	68	39	

Is there sufficient evidence to indicate a difference between the mean response times of the two disk drives at level of significance 5%? (10 mks)

b) The following table shows data for two variables x and y.

x:	8.3	8.3	12.1	12.1	17.0	17.0	14.0	24.3	24.3	24.3	33.6
y:	227	312	362	521	640	539	728	945	738	759	1263

You may use the following summaries:

$$\sum x = 198.3 \quad \sum x^2 = 4198.03 \quad \sum y = 7034 \quad \sum xy = 149354.4 \quad \sum y^2 = 5390382$$

(10 mks)

Question 4

a) Given below is the contingency table showing the classification of patients who attend a certain hospital according to level of income and frequency of their attendance of the hospital

Church attendance	Income		
	Low	Middle	High
Never	27	48	15
Occasional	25	63	24
Regular	22	74	12

Test whether there is a relationship between hospital attendance and income at 5% level of significance (8 mks)

b) A study of the effect of enzyme inducing agents on the survival times of rats exposed to lethal levels of nitrogen dioxide reported the following data on survival times of rats exposed to nitrogen dioxide (70ppm) through different injection regiments. Each group had different number of rats.

Regiment	Sample size	Sample mean	Sample standard deviation
1. Control	14	166	32
2. 3 methylcholanthrene	13	303	53
3. Allylisopropylacetamide	12	266	54
4. Phenobarbital	14	212	35
5. Chlorpromazine	11	202	34
6. P Aminobenzoic acid	14	184	31

- Calculate the estimates of the within-group variance.
- Calculate the estimates of the between-group variance.
- At 10% of significance, test the null hypothesis that the mean survival time does not depend on injection regimen. (12 mks)