TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Applied & Health Sciences

DEPARTMENT OF MATHEMATICS & PHYSICS

UNIVERSITY EXAMINATION FOR:
BACHELOR OF MEDICAL LABORATORY SCIENCES
(BMLS – Y3 S1)

AMA 4320: BIOSTATISTICS

END OF SEMESTER EXAMINATION
SERIES: APRIL 2014
TIME ALLOWED: 2 HOURS

Instructions to Candidates:
You should have the following for this examination
- *Mathematical tables*
- *Scientific Calculator*

This paper consist of **FIVE** questions
Answer question **ONE (COMPULSORY)** and any other **TWO** questions
Maximum marks for each part of a question are as shown
This paper consists of **THREE** printed pages

Question One (Compulsory)

a) Briefly describe the following terms as applied in Biomedical studies:
  (i) Surveys
  (ii) Clinical trials   **(4 marks)**

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b) (i) Define what is simple random sampling. **(2 marks)**
    (ii) Give reasons for using simple random samples **(1 mark)**

c) Table 1 gives a frequency table showing the haemoglobin level for 122 low-attitude minors.

Hemoglobin Level (g/cm^3)	Frequency
11.0 – 11.9	6
12. 0 – 12.9	21
13.0 – 13.9	29
14.0 – 14.9	43
15.0 – 15.9	19
16.0 – 16.9	3
17.0 – 17.9	1
Sum	**122**

    (i) Draw a cumulative frequency diagram **(3 marks)**
    (ii) Using the cumulative frequency, find the median. **(1 mark)**

d) The following probability distribution show the star rating of 5 different bio-diesel cars in a head collision test. The more the stars the better is the level of crash protection in a head on collision.

Number of Stars, X	P(x)
1	0
2	0.0408
3	0.1735
4	0.6020
5	0.1837

Find:
(i) The mean **(3 marks)**
(ii) The standard deviation of x **(4 marks)**

e) Suppose x is a binomial random variable with n = 200 and where n is the sample sixe and p = 0.01.
Find:
    $P(x \leq 1)$
(i) **(3 marks)**
    $P(x = 8)$
(ii) **(3 marks)**

Using Poisson approximation to the binomial distribution, determining:
    $P(x \leq 1)$
(iii) **(3 marks)**
    $P(x = 8)$
(iv) **(3 marks)**

Question Two

a) The p.d.f of x is shown in the figure below:
    (i) Determine the value of a **(1 mark)**
    (ii) Graph f(x) approximately **(10 marks)**

    f(x)

b) The National Science Foundation in the US reports that 70% of graduate students who earn Ph.D degrees in Medicine are foreign national. Consider the number y of foreign students in a random sample of 25 medical students who recently earned their Ph.Ds
    (i) Find $P(Y = 10)$ **(2 marks)**
            $P(Y \leq 3)$
    (ii) Find **(3 marks)**
                    μ σ
    (iii)   Find the mean   and standard deviation **(2 marks)**
    (iv) Interpret the results in (iii) **(2 marks)**

Question Three

A batch of 5000 electric incubators have a mean life of 1,000 hours and a standard deviation of 75 hours. Assume a Normal Distribution (Draw sketches to explain your answer)

a) How many electric incubators will fail before 900 hours? **(3 marks)**

b) How many incubators will fail between 950 and 1000 hours? **(3 marks)**

c) What proportion of incubators will fail before 925 ours? **(3 marks)**

d) Given the same mean life, what would the standard deviation have to be to ensure that not more than

    20% of lamps fail before 916 hours? **(3 marks)**

e) Suppose X is a normally distributed random variable with mean $\mu = 10$ and standard deviation $\sigma = 2.1$. Find:

(i) $P(x \geq 11)$ **(3 marks)**

(ii) P(7.6 <x<12.0) **(3 marks)**

(iii) P(x <7.6 or x>12.1) **(2 marks)**

Question Four

The following data has been collected regarding watts of bulbs and cost of manufacture:

Watts	Manufacture Cost
8.5	210
9.2	250
7.9	290
8.6	330
9.4	370
10.1	410

a) Plot the data above on a scatter diagram and decide whether there is correlation between watts and cost of manufacture. **(4 marks)**

b) Calculate the correlation coefficient r for the above data and interpret it. **(5 marks)**

c) Calculate r^2 for the above data and interpret it. **(2 marks)**

d) The following data relates to costs incurred at various output levels. Construct a liner regression model between output level (independent) and cost incurred (dependent)

Output Level (units)	Cost Incurred
40	812
55	890
68	955
73	948
82	1050
89	1100
94	1160
95	1095
103	1250
110	1380

Question Five

a) Assuming a Binomial Distribution what is the probability of a doctor making 0, 1, 2, 3, 4, 5 or 6 correct diagnosis in 6 medical examinations, if the probability of making a correct diagnosis is 0.3?

(14 marks)

b) If 3% of the vaccine produced by a company are defective determine the probability that in a sample of 80 vaccines:
   (i) TWO
   (ii) More than two will be defective **(6 marks)**