TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Applied & Health Sciences

DEPARTMENT OF MATHEMATICS & PHYSICS

UNIVERSITY EXAMINATION FOR:

BACHELOR OF SCIENCE IN COMMUNITY HEALTH (BSCH)

AMA 4320: BIOSTATISTICS

END OF SEMESTER EXAMINATION
SERIES: DECEMBER 2013
TIME ALLOWED: 2 HOURS

Question One (Compulsory)

a) Define the following terms:
  (i) A random variable   (**1 mark**)
  (ii) An estimator   (**1 mark**)
  (iii) Biostatistics   (**1 mark**)

b) State any FOUR properties o a good estimator   (**4 marks**)

c) List any FOUR methods of sampling   (**4 marks**)

d) A sample of 100 apparently normal adult males, 25 years old, had a mean systolic blood pressure of 125. If it is believed that the population standard deviation is 15, find the 95% confidence interval for μ

(4 marks)

e) State any THREE properties of the mean **(3 marks)**

f) If the mean and standard deviation of serum iron values per healthy men are 120 and 15 micrograms per 100ml, respectively, what is the probability that a random sample of 50 normal men will yield a mean between 115 and 125 micrograms per 100ml. **(4 marks)**

g) The following are ages of patients admitted to the emergency room of a hospital. Construct a frequency distribution table starting with a class of 10 – 14.

3	6	3	5	3	5	3	5	4	5	4	4
2	3	3	7	5	4	8	3	2	1	2	8
4	4	6	5	1	1	1	3	3	2	2	1
3	6	1	3	2	3	6	1	0	8	8	6
	2	2	2	2	1	1	2	1	2	1	2
5	3	2	2	1	7	3	0	4	9	6	8
1	2	2	2	2	2	6	5	3	4	1	1
7	7	1	4	2	3	1	5	4	2	3	6

(5 marks)

h) If the mean number of serious accidents per year in a large factory is five, find the probability that in the current year, there will be exactly seven accidents. **(3 marks)**

Question Two

A study concerned with the presence of significant psychiatric illness in heterozygous carriers of gene for the wolfram syndrome was conducted. Among the subjects studies were 543 blood relative of patients with wolfram syndrome. The following is a frequency distribution of the ages of there blood relatives.

Age		Frequency
20 -	29	55
30 -	39	93
40 -	49	113
50 -	59	90
60 -	69	85
70 -	79	73
80 -	89	29
90 -	99	5
Total		543

Using the above data, estimate:
  (i)   Median **(3 marks)**
  (ii) Mode **(3 marks)**
  (iii) Mean **(3 marks)**

(iv) 35th Percentile   **(3 marks)**
 (v) Standard deviation   **(4 marks)**
(vi) Quartile range   **(4 marks)**

Question Three

Height is frequently named as a good predict-variable for weight among people of the same age and gender. The following are the heights and weights of 14 males between the ages of 19 and 26 years who participated in a study conducted at some community health facility.

Weight (Y)	Height (X)
84	185
99	180
64	173
71	168
65	175
80	183
70	184
69	174
56	164
66	169
89	205
60	161
65	177
79	174

a) Plot the scatter diagram of the above set of data and interpret the resultant figure   **(3 marks)**

b) Calculate the correlation coefficient between weight and height.   **(5 marks)**

c) Compute the coefficient of determination between the two variables and interpret your finding.
                                                                                                 (3 marks)
d) Fit a regression model between X and Y   **(7 marks)**

e) Determine the error term given that $X = 175$ **(2 marks)**

Question Four

a) The following table shows the results of a survey in which the subjects were a sample of 300 adults residing in a certain metropolitan area. Each adult was asked to indicate which of three policies they favoured with respect to smoking in public places.

Highest Education Level	No Restrictions On smoking	Smoking allowed in designated area	No smoking area	No opinion
College Graduate	5	44	23	3
High School Graduate	15	100	30	5
Grade School Graduate	15	40	10	10

Is there a relationship between level of education and attitude toward smoking in public places at 9 = 0.05 **(10 marks)**

b) Define the following terms:
  (i)   Test of hypothesis **(1 mark)**
  (ii) Type two error **(1 mark)**

c) A survey of 100 similar sized hospitals revealed a mean daily census in the pediatrics service of 27 with a standard deviation of 6.5. Does their data provide sufficient evidence to indicate that the population mean is greater than 25? let $\alpha = 0.05$ **(8 marks)**

Question Five

a) Suppose the average length of stay in a chronic disease hospital of a certain type of patient is 60 days with a standard deviation of 15. If it is reasonable to assume an approximately normal distribution of lengths of stay, find the probability that a randomly selected patient from this group will have a length of study:
  (i)   Greater than 50 days **(3 marks)**
  (ii)   Less than 30 days **(3 marks)**
  (iii) Between 30 and 60 days **(3 marks)**

b) In a certain population, an average of 13 new cases of esophagus cancer are diagnosed each year. If the annual incidence of esophagus cancer follows a poison distribution, find the probability that in a given year the number of newly diagnosed cases of esophagus cancer will be:
  (i)   Exactly 10 **(2 marks)**
  (ii) Between a and 10 inclusive **(4 marks)**

c) The probability that a person suffering from migraine headache will obtain relief with a particular drug is 0.9. three randomly selected sufferers from migraine headache are given the drug. Find the probability that the number obtaining relieve will be:
  (i)   Exactly zero **(2 marks)**
  (ii) Two or fewer **(3 marks)**