TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF APPLIED AND HEALTH SCIENCES

DEPARTMENT OF MATHEMATICS & PHYSICS

UNIVERSITY EXAMINATION FOR:

UNIVERSITY EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE IN ENVIRONMENTAL HEALTH

BSEH 16J/YEAR3/ SEMESTER2

APH 4320 BIOSTATISTICS

SPECIAL/ SUPPLIMENTARY EXAMINATIONS
SERIES: September 2018
TIME: 2 HOURS

Instructions to Candidates
This paper consists of FIVE questions
Answer question ONE (COMPULSORY) and any other TWO questions.
This paper consists of two printed pages.
Mobile phones are NOT allowed in the examination room

Question one: **30 Marks**

a) The birthweight for new born babies in a local hospital has a Normal distribution with a mean of 3.4 kg and a standard deviation of 0.6 kg.

   i)   What is the probability of having a birthweight between 2.5kgs and 4.5kgs? (3 marks)

b) Provided with the following list of students score in biostatistics unit;
     3,7,5,13,20,23,39,23,40,23,14,12,56,23,29. Calculate the students mean score. (3 marks)

c) i) Compute the median, mode and interquartile range from these data;
     13,18,20,13,14,13,16,14,21,13,15. (3 mark)

ii) Draw a box plot using the data. (2 Marks)

d) The mean score in a test of 16 students was 4.5 and the standard deviation was 0.6.
   i)   Calculate the standard error of the mean (2 marks)
   ii)   Estimate the 95% confidence interval of the mean. (4 marks)
   iii)   Provide an interpretation for the estimated 95% confidence interval. (1 marks)

e) What is the most appropriate measure of location for a normal distribution, and why? Explain briefly whether the measure you have named is appropriate for a skewed distribution. (4 marks)

f) The estimated Pearson's correlation coefficient between mother's gestation age in weeks and the baby weight was 0.94.
   i)   Interpret the estimated correlation. (1 marks)
   ii)   With help of a scatter plot with a predicated line of best estimate, show how the mother's gestation age in weeks and the baby weight were related. (2 marks)
   iii)   If the estimated Pearson's correlation coefficient was zero, interpret the relationship. (1 Marks)

g) A researcher investigated whether taking physical exercise affects people's chances of getting a cold. 230 participants were recruited for the study. Out of 115 who did physical exercise 100 people did not get a cold. Out of those who did not take physical exercises, 22 got a cold. Is there any reason to believe that physical exercise reduces chances of getting a cold at 5 % level of significance? (2 marks)

h) A study was undertaken to evaluate the effect of percutaneous transluminal coronary angioplasty (PTCA) in patients with one-vessel coronary artery disease. A random sample of one hundred and seven patients with coronary artery disease were given PTCA. Patients were given exercise tests at baseline and after 6 months of follow-up. Exercise tests were performed up to maximal effort until symptoms (such as angina) were present. The "change" in the duration of exercise was calculated. "Change" is defined as the 6 month test minus the baseline test. The mean change was 2.1 minutes and the standard deviation of the changes was 3.1.

   i.   What statistical test can be performed to see if there has been a statistically significant change in duration of exercise for this group of patients given PTCA? (1 mark)
   ii) The statistician decided to calculate the 95% confidence interval of the mean change. The computed 95 % confidence interval was from 1.80 to 2.40 minutes. Can we conclude from this study that PTCA is effective in increasing exercise duration? Explain your answer. (1 mark)

Question two (20 marks)

A beer binger is defined as someone who usually drinks six or more bottles of beer per drinking session. Beer drinking habits were recorded from 1641 middle-aged men from Kuopio, Finland. The 1641 men were followed up on average for 7.7 person-years and cardiovascular death recorded from death certificates. The table below shows the collected data;

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Beer binger?	Cardiovascular death?		
	Yes	No	Total
Yes	7	63	70
No	52	1519	1571
Total	59	1582	1641

i) Suggest the statistical test you will use to study the relationship between being a beer binger and risk of cardiovascular death. (2 marks)

ii) State the null hypothesis you will test using the suggest statistical test above. (3 marks)

iii) Using the suggested statistical test suggested, test the null hypothesis and provide interpretation of the results. (15 marks)

Question three (20 marks)

Below is alcohol consumption (g/day) data of 413 participants from Scottish Heart Health Study (SHHS);

Daily alcohol consumption (g/day)	0-5	5-10	10-15	15-20	20-25
Number of men	78	94	128	65	48

i) Calculate the mean daily alcohol consumption (g/day) (8 marks)

ii) Calculate the variance and standard deviation (10 marks)

iii) What does the calculated standard deviation suggest about the distribution of number of mean alcohol consumption behaviour? (2 marks)

Question Four (20 marks)

An actuarial scientist thinks that the insurance premiums for medical doctors is linearly associated with the number of years worked. A random sample of eight medical doctors insured with a company and having similar insurance policies was selected. The following table lists their working experiences in years and annual insurance premiums.

Working experiences(years) x	Annual insurance Premium(Kshs) y
5	64,000
2	87,000
12	50,000
9	71,000
15	44,000
6	56,000
25	42,000
16	60,000

a) Using the least square method, calculate the regression co-efficient and write the regression equation (12 marks)

b) Explain the meaning of the estimated value of the regression coefficient in the context of this study. (You do not need to discuss the constant coefficient.) (3 marks)

c) What average annual insurance premium would be predicted for a medical doctor with 10 years of work experience? (5 marks)

Question Five (20 marks)

Iron levels of pregnant women has life-long detrimental effects on child mortality, growth and morbidity. To improve Iron levels of pregnant women in Mombasa County, the World Vison (WV) a Non-Governmental Organization started a programme of providing Iron supplements to pregnant women. The study outcome was baby's birth weight with a null hypothesis of no difference of birth weight between children born to mothers taking Iron supplements and those not taking Iron supplements.

The table below presents the mean and standard deviation (SD) for birth weight in grams (g), according to whether or not Iron supplements were used during pregnancy.

Iron supplements use during pregnancy	Mean birth weight (g)	SD(g)	Number of women in group
Yes	3090	436.0	717
No	3004	465.8	201

a) Name the appropriate statistical test to test the hypothesis. (2 marks)

b) Perform the statistical test above (a). Interpret your results. (15 marks)

c) Explain the assumptions you made in using the above statistical test (a). (3 marks)