



GWANDA STATE UNIVERSITY

LCS: 1102

FACULTY OF LIFE SCIENCES

DEPARTMENT OF ANIMAL SCIENCE & CROP SCIENCE

BIOMETRY

EPOCH MINE: FILABUSI

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JULY 2019: EXAMINATION

Time : 3 hours

Candidates should attempt **Four** questions from this examination paper, each questions has total of [**25 marks**].

Instruments and Materials

- Scientific Calculator.
- Statistical Tables

- A1.** (a) What is Biometry? [5]
- (b) Classify each of the following into either qualitative (nominal or ordinal) or quantitative (continuous or discrete)
- (i) Birth weight, date of birth and fathers race of a new baby [1]
- (ii) Level of cholesterol in a cubic milliliter of blood [1]
- (iii) Species of a tree (redwood, cedar, pine, oak) [1]
- (iv) Blood group type (A, B, AB). [1]
- (c) Frequency Distribution Table

Age (in years)	10 - 15	15 - 20	20 - 25	25 - 30	30 - 35	35 - 40
No. of persons	42	60	150	70	35	20

- Calculate the mean and standard deviation. [6]
- (d) The height of barley plants in a field is assumed to follow normal distribution with mean height 35 cm and standard deviation 4.0 cm. A sample of 150 plants was selected from a plot of the field. Find the number of plants
- (i) having height more than 40 cm [5]
- (ii) between the heights 32 cm and 38 cm [5]

- A2.** (a) The following table gives the yield of wheat from 10 equal plots

Plot No.	1	2	3	4	5	6	7	8	9	10
Yield (kg)	60	40	50	45	60	55	65	50	65	55

- If the area of each plot is 242 square metres, find the average yield per hectare, mode and median? [6]
- (b) Three dairy farms A, B and C produce milk with 30, 25 and 45 percent respectively. A milk packet is found defective if it contains fat percentage 3 or less. Three farms A, B and C produce defective milk packets in the ratio 2 : 3 : 5. A milk packet is drawn at random and it is found defective and what is the probability that it is from farm C? [5]
- (c) In a fertilizer factory the average daily production of Ammonia was recorded as 26 tons. On random inspection of 10 days the daily production were found to be 24, 32, 28, 20, 34, 32, 18, 25, 40 and 27. Test whether sample production is in conformity with the record at probability level 0.01. [14]

- A3.** In a rainy village in the Zimbabwe, the local TV weatherman is often criticized for making inaccurate forecasts for daily precipitation. On each of 30 randomly selected days last summer, his precipitation forecast (x) for the next day was recorded along with the actual precipitation (y) for that day. These data are shown in the following table (in millimetres of rain).

x	y	x	y	x	y
1.0	.6	0	0	.4	.2
0	.1	0	.1	.2	.5
.2	0	.1	.2	.1	.1
0	0	.2	.2	0	.2
.5	.3	.1	0	.1	0
1.0	1.4	2.0	2.1	.2	.1
.5	.3	.4	.2	1.4	1.2
.1	.1	.2	.1	.5	1.0
0	.1	0	0	0	.5
2.0	.3	.3	.2	0	0

Do the following.

- (a) Construct a scatter diagram for these data. [6]
- (b) Find the correlation coefficient between the two variables. [4]
- (c) State the regression model [5]
- (d) Find the regression line with actual precipitation as a dependent variable and predicted precipitation as an independent variable. [10]
- A4.** (a) A and B throw two dice in turn. Those who throw 8 will be declared as winner. What is the probability of A winning if he starts first? [6]
- (b) The daily milk yield of 800 goats assumes to follow normal distribution with standard deviation 0.85 kg. There are 100 goats which give daily milk below 3 kg. Find the mean yield of a goat and also the probability that the yield per day exceeds 5.5 kg/goat. [7]
- (c) The heights of plants in a particular field were assumed to follow normal distribution. A random sample of 10 plants were selected and whose heights (in cms) were recorded. as 96, 100, 102, 99, 104, 105, 99, 98, 100 and 101. Discuss in the light of the above data the mean height of plants in the population is 100. [12]

- A5.** (a) Define the various measures of dispersion and discuss their relative advantages. [6]
 (b) In a citrus orchard, it is found that 10% of them are affected by a particular disease. Obtain the probability that exactly 15 trees were affected out of 100 trees? [5]
 (c) The number of noxious and weed seeds were recorded in 160 samples

No. of noxious & weed seeds per sample	0	1	2	3	4	5
No. of Samples	41	35	34	17	23	10

Fit a Poisson distribution to the above data and compute $P(X > 3)$. [8]

- (d) In certain district the incidence of rinderpest disease in cattle was found to be 8 percent in a dairy farm consisting of 210 animals. Find the average number of animals effected with the disease, standard deviation, coefficient of skewness assuming that the incidence of disease follows Binomial distribution. [6]
- A6.** (a) A local pick-your-own farmer decided to grow blueberries. The farmer purchased and planted eight plants of each of the four different varieties of highbush blueberries. The yield (in kilograms) of each plant was measured in the upcoming year to determine whether the average yields were different for at least two of the four plant varieties. The yields of these plants of the four varieties are given in the following table.

Berkeley	5.13	5.36	5.20	5.15	4.96	5.14	5.54	5.22
Duke	5.31	4.89	5.09	5.57	5.36	4.71	5.13	5.30
Jersey	5.20	4.92	5.44	5.20	5.17	5.24	5.08	5.13
Sierra	5.08	5.30	5.30	4.99	4.89	5.30	5.35	5.26

- (i) We are to test whether the mean yields for all such bushes of the four varieties are the same. Write the null and alternative hypotheses. [2]
 (ii) What are the degrees of freedom for the numerator and the denominator? [2]
 (iii) Calculate SSB, SSW, and SST. [6]
 (iv) Show the rejection and non-rejection regions on the F-distribution curve for .01. [2]
 (v) Calculate the between-samples and within-samples variances. [3]
 (vi) What is the critical value of F for .01? [2]
 (vii) What is the calculated value of the test statistic F ? [2]
 (viii) Write the ANOVA table for this question. [4]
 (ix) Will you reject the null hypothesis stated in part (i) at a significance level of 1%? [2]

END OF QUESTION PAPER