Uva Wellassa University
B.Sc. in Export Agriculture

End Semester Examination Dec/ Jan 2009/10
Year III Semester I

Applied Statistics AAS 301-3

Instructions

Answer **four (04)** questions only
No. of questions : Six (06)
No. of pages : Six (06)
Total marks allocated : 60/100
Time : Two hours (02 hrs)

Part II – Essay

1.

a. What are the demerits of arithmetic mean as a measure of central tendency of a data series?

b. Number of animals in 84 buffalo herds in Hambantota District is given below.

01	01	01	02	02	02	02	02	02	03	03	03
04	04	04	04	04	04	04	05	06	07	08	09
09	09	09	10	10	10	10	10	11	11	11	13
13	14	14	15	15	16	17	17	17	18	18	18
18	19	20	20	21	22	22	22	23	24	25	26
27	28	28	28	29	30	30	30	31	31	31	31
35	40	47	52	56	61	67	73	75	80	84	90

i. Find mean, median and mode of the data set.

ii. Find variance, standard deviation, and coefficient of variance of the data set.

iii. Find the IQR of the data set using a stem and leaf diagram.

iv. Find whether there are any outliers using the box and whisker plot.

2.

a. What are the basic properties of standard normal distribution?

b. Thousand (1000) candidates who applied for a job appeared in an IQ test. The average marks were calculated as 53 and the standard deviation was 12.

   i. How many students have obtained marks less than 40?

   ii. How many students have obtained more than 75?

   iii. How many students are in the group of 40 – 60?

   iv. If the top 10% are to be called for the interview, what is the cut-off mark to select the students?

3.

a. What are the merits of the Karl Pearson Correlation Coefficient compared to covariance as an indicator of relationship between two variables?

b. What are the demerits of Pearson Correlation Coefficient as an indicator of relationship between two variables?

c. To find the relationship between the weight of root nodules and length of the roots of the chick pea plants following information were collected by a student. Calculate the Pearson correlation coefficient and interpret the results.

Weight of root nodules (g)	Length of roots (cm)
27	59
12	30
34	62
57	70
74	32
17	22
45	64
80	88

4.

a. Following table summarizes the information collected by a survey of 100 tea small holders of Badulla District. The researcher wants to check whether there is an association between the variety and the average yield of tea (kg / month / ha).

Number of holdings in each category:

		Average paddy yield Kg / ha / month			
Variety		0 - 250	251 - 350	350 and above	Total
	Variety – I	1	1	13	15
	Variety – II	1	2	17	20
	Variety – III	16	19	30	65
Total		18	22	60	100

Perform Chi-Square test after making necessary arrangements of the above table. (08)

b. Twelve obese ladies are attending the aerobics regularly at faculty auditorium to reduce their weights. Following table gives their weights (kg) before the program and after three months of regular aerobics.

Name	A	B	C	D	E	F	G	H	I	J	K	L
Before	73	68	84	90	57	61	59	69	81	72	76	63
After	70	68	80	92	59	63	60	65	76	70	74	65

Test whether there is an impact of aerobics on weight reduction using an appropriate statistical test.

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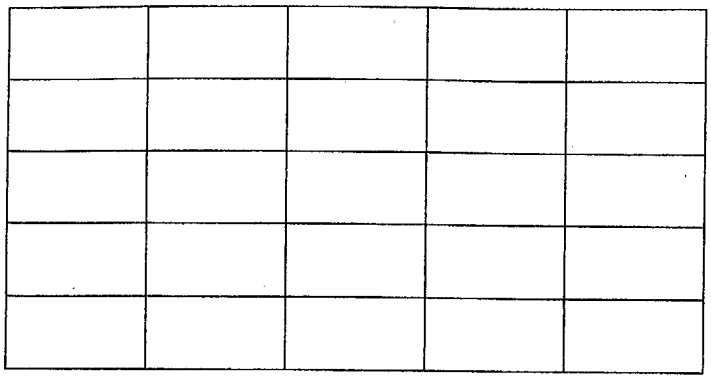
5.

a. To compare the means of different samples, what are the advantages of **ANOVA** compared to simple**'t'** test.

b. There are five varieties (V_1, V_2, V_3, V_4 and V_5) to be tested for yield in a farm. The research farm has 20 plots as shown in the diagram.

Direction A ⟶



Show the field layout in following circumstances.

i. All plots are homogenous

ii. Fertility gradient in direction B

iii. Fertility gradients in both directions

What are the ANOVA models that can be used in each field layout?

c. What are the reasons for the needs of non-parametric ANOVA instead of Fisher's ANOVA models in biological and social sciences?

6.

a. Define the followings.

   i. Type I error and Type-II error

   ii. One tailed and two tailed test

b. Management of irrigation was transferred (IMT) to Farmer Organizations from Mahaweli Authority officials in Udawalawa Irrigation Scheme in 1994 for better performance. Students wanted to find whether IMT has increased the water availability according to farmers view. Farmers were asked whether water availability has been increased or decreased after IMT and number of farmers in different ideas is given below.

Highly increased	– 57
Somewhat increased	– 66
No change	- 23
No idea`	- 31
Not answered	- 15
Somewhat reduced	- 24
Drastically reduced	- 12

Using an appropriate statistical procedure, test whether the IMT has improved the water availability in Udawalawa irrigation and settlement scheme.

Statistical equations

$$Z = \frac{2x \pm 1 - N}{\sqrt{N}}$$

$$Z = \frac{T^{+} - N(N+1)/4}{\sqrt{N(N+1)(2N+1)/24}}$$

$$KW = \left[\frac{12}{N(N+1)}\sum n_j \bar{R}_j^2\right] - 3(N+1)$$

$$t = 1 - \left[\frac{\sum (t_i^3 - t_i)}{N^3 - N}\right]$$

$$CD = \frac{Z_\alpha}{k(k-1)}\sqrt{\frac{N(N+1)}{12}\cdot\left(\frac{1}{n_2} + \frac{1}{n_2}\right)}$$

$$Fr = \left[\frac{12}{Nk(k+1)}\sum R_j^2\right] - 3N(k+1)$$

$$CD = Z_{\alpha/k(k-1)}\sqrt{\frac{k((k+1)}{6N}}$$

Statistical Equations

$$S^2 = \left(\sum_{i=1}^{n} X_i^2 - n\bar{X}^2\right)$$

$$s_p = \sqrt{\frac{(n_1 - 1)s_1^2 + (n_2 - 1)s_2^2}{(n_1 + n_2 - 2)}}$$

Distribution Functions:

Binomial Distribution - $P(X = x) = n_{P_x}\, p^x (1 - p)^{(n-x)}$

E[X]= *np* Var[X]= *np(p-1)*

Poison Distribution - $P(X = x) = \frac{e^{-\lambda}\lambda^x}{x!}$

E[X]= λ Var[X]= λ

$$Z = \frac{2x \pm 1 - N}{\sqrt{N}}$$

$$Z = \frac{T^+ - N(N+1)/4}{\sqrt{N(N+1)(2N+1)/24}}$$

$$KW = \left[\frac{12}{N(N+1)}\sum n_j \bar{R}_j^2\right] - 3(N+1) \qquad t = 1 - \left[\frac{\sum(t_i^3 - t_i)}{N^3 - N}\right]$$

$$CD = \frac{Z_\alpha}{k(k-1)} \cdot \sqrt{\frac{N(N+1)}{12} \cdot \left(\frac{1}{n_2} + \frac{1}{n_2}\right)}$$

$$Fr = \left[\frac{12}{Nk(k+1)}\sum R_j^2\right] - 3N(k+1) \qquad CD = Z_{\alpha/k(k-1)} \cdot \sqrt{\frac{k((k+1)}{6N}}$$