

**VISVA-BHARATI**

**Palli Siksha Bhavana (Institute of Agriculture)**

**Department of Agricultural Statistics**

**M. Sc. (Ag.) Semester: II Examination, 2026**

**Course: STAT 502**

**(Statistical Methods for Applied Sciences)**

**Time: Two Hours**

**Full marks: 30**

Questions are of equal value or as indicated in the margin

**Answer any three questions**

1. (a) What do you mean by expectation of a random variable? Discuss the important properties of expectation of a random variable.  
(b) Write down the important properties of the Poisson distribution. (5+5=10)
2. (a) The *p.d.f.* of a random variable  $X$  is given as:  $f(x) = ce^{-\frac{1}{2}\left(\frac{x-100}{5}\right)^2}$ ;  $-\infty < x < \infty$ . Find the value of  $c$ , mean, mode and the variance of the distribution. Also discuss about the skewness and kurtosis status of the distribution.  
(b) Let  $X_1 \sim N(5, 4)$ ,  $X_2 \sim N(0, 9)$  and  $X_3 \sim N(1, 1)$ ; where  $X_1$ ,  $X_2$ , and  $X_3$  are independent random variables. Find the distribution of two linear combinations  $2X_1 - 3X_2 - 2X_3$  and  $X_1 - 3X_2 - 5X_3$ . (5+5=10)
3. Define correlation and explain its importance in statistical analysis. Discuss different types of correlation with examples. Write down the expression for Spearman's rank correlation coefficient. (10)
4. Explain paired *t*-test with an agricultural example. (10)
5. Write short note on any two of the followings: (5×2=10)
  - (a) Standard normal distribution
  - (b) Maximum value of the variance of a binomial distribution having parameters  $n$  and  $p$
  - (c) Population, sample, sampling unit, sampling frame, parameter and statistic

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**M. Sc. (Ag.) Semester: II Examination, 2026**

**Course: STAT 522**

**(Data Analysis using Statistical Packages)**

**Time: 120 minutes**

**Full marks: 30**

Questions are of equal value or as indicated in the margin

**Answer any three questions**

1. Explain the procedure of analysis in a randomized block design with 6 treatments and 3 replications. How can you use SPSS for this problem. (10)
2. State the difference between RStudio and SPSS. Write the steps of SPSS when we want to check the normality of data. (10)
3. State the difference between correlation and regression. Write the R code for scatter diagram. What are the assumptions of multiple linear regression. (10)
4. A researcher wants to study the effect of a new fertilizer on crop yield. The yields (in quintals per hectare) from the same plots before and after applying the fertilizer are given below: (10)

| Plot               | 1  | 2  | 3  | 4  | 5  | 6  |
|--------------------|----|----|----|----|----|----|
| Before Application | 22 | 20 | 23 | 24 | 21 | 26 |
| After Application  | 24 | 21 | 25 | 24 | 23 | 30 |

Which statistical test should be used to verify this claim? Describe the test procedure in details. Also write the R code for the test.

5. Write short note on any two (5×2=10)
  - (a) Box plot with R code
  - (b) Chi-square test for goodness of fit
  - (c) Student's *t* test

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**Department of Agricultural Statistics**  
**M. Sc. (Ag.) Semester: II Examination, 2026**  
Course: **STAT 521**  
**(Applied Regression Analysis)**

**Time: 120 minutes**

**Full marks: 30**

Questions are of values as indicated in the margin

**Answer any three questions**

- 1**      The equations of two regression lines obtained in a correlation analysis study are as follows:  $8x - 10y + 66 = 0$       &       $40x - 18y - 214 = 0$       **10**

(a) Identify the regression lines of  $x$  on  $y$  and  $y$  on  $x$ .

(b) Find the value of correlation coefficient.

(c) Find mean value of  $x$  and  $y$

(d) Regression value of  $y$  when  $x = 32$

(e) Regression value of  $x$  when  $y = 50$
- 2**      Identify the models and write down the normal equations for these two given models      **10**

(a)  $Y = at^b$     (b)  $Y = ab^t$
- 3**      What do you mean by multicollinearity? What are the different methods of detection of multicollinearity? Write down the remedies for handling multicollinearity.      **10**
- 4**      What do you mean by Test of significance of a population correlation coefficient based on  $t$ -test? Suppose a random sample of 11 pairs of observations from a normal population gives a correlation coefficient ( $r$ ) = 0.239 and calculated value of  $t = 0.74$ . Is it significant at 5% level of significance?  $t_{9(5\%)} = 2.262$       **10**
- 5**      Write short note on any two      **10**

(a) Dummy Variables and Logistic Regression

(b) Forward Selection of variables

(c) Correlation between variables measured on different scales of measurement

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