



DOON UNIVERSITY, DEHRADUN UTTARAKHAND, INDIA
End-term Examination, Academic Year: 2022-2023(Even Semester),
Department of Phys. /Chem. /Comp. Science -Under
Department of Mathematics, School of Physical Sciences,
Academic Programme: Integrated M.Sc. 1st Year , 2nd semester
Course code and Paper title: MAG-151 Generic Mathematics (Econometrics).

Time Allowed: 3Hours

Maximum Marks: 50

Note: Attempt all six questions in Section A. Each question carries 2 marks.
Attempt any four questions in Section B. Each question carries 6 marks.
Attempt any two questions in Section C. Each question carries 12 marks.

SECTION: A

(Very Short Answer Type Questions)

(Marks:6X2=12)

1. Write short note on linearity in the variables and linearity in the parameters.
2. Write Gauss Markov theorem.
3. Explain the followings: Dummy variables and Forecasting.
4. Explain the terms of population regression function (PRF), and sample regression function, (SRF).
5. What is the difference between the stochastic error term and the residual, \hat{u}_i ?
6. Write the formulas for partial correlation coefficients for three variable linear model.

SECTION: B

(Short Answer Type Questions)

(Marks: 4X6=24)

7. (i). Find the mean and variance of normal distribution.
(ii). Show that the area under the normal curve is one.
8. Explain the following: (i) the coefficient of determination. (ii) The measure of 'goodness of fit'.
9. (i). Given $\sum \hat{u}_i^2 = 9.83$, $n = 12$, $\sum (Y_i - \bar{Y})^2 = 105.118$, find r^2 .
(ii). Compute the student t for the following values in a sample of 8: -4, -2, -2, 0, 2, 2, 3, 3. Also test whether sample is taken from the population with mean $\mu = 0$.
Given: at 5% level of significance, $t_{\text{tabulated value}} = 1.96$.

10. Prove the following: Let $k_i = \frac{x_i}{\sum x_i^2}$. then (i). $\sum k_i = 0$; (ii). $\sum k_i^2 = \frac{1}{\sum x_i^2}$.

11. Determine whether the following models are linear in the parameters, or the variables, or both. Which of these models are linear regression models?

Model	Descriptive Title
a. $Y_i = \beta_1 + \beta_2 \ln X_i + u_i$	Semilogarithmic
b. $\ln Y_i = \ln \beta_1 + \beta_2 \ln X_i + u_i$	Logarithmic or double logarithmic
c. $\ln Y_i = \beta_1 - \beta_2(1/X_i) + u_i$	Logarithmic reciprocal

SECTION: C

(Long Answer Type Questions)

(Marks: 2X12=24)

12. (i). Explain the assumptions underlying the method of least squares, in the classical linear regression model.
 (ii). Describe ordinary least square (OLS) method for a data $(X_i, Y_i), I = 1, 2, \dots, n$, to fit in Linear model.
13. Write short note on the multiple coefficient of Determination, R^2 , and adjusted multiple coefficient of Determination \bar{R}^2 . When $\sum e_i^2 = 13.704$ and $\sum y_i^2 = 1634, n = 10$, and $k = 3$ calculate the value of multiple coefficient of Determination, R^2 , and adjusted multiple coefficient of Determination \bar{R}^2 .
14. Following table gives the bushels of corn per acre, Y, resulting from the use of various amounts of fertilizer X_1 , and insecticides X_2 both in pounds per acre, from 1971 to 1980.

Year	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
Y	40	44	46	48	52	58	60	68	74	80
X_1	6	10	12	14	16	18	22	24	26	32
X_2	4	4	5	7	9	12	14	20	21	24

Find the estimators $\hat{b}_1, \hat{b}_2, \hat{b}_0$, and three variable linear regression model.