**Birla Institute of Technology & Science, Pilani**
**Pilani Campus – Rajasthan**
**Econometric Methods (ECON F241)**
**Mid-Semester Examination**

**Date**: 16/Mar/2023

**Maximum Marks**: 60                                                    **Time Duration**: 90 Minutes

**Instructions**:
- All questions are compulsory.
- Please note that marks would be deducted in case of No Valid Interpretation and necessary steps, wherever required.
- A calculator is allowed.

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**Q1**: For the given pair of values for two variables, $X$ and $Y$:

| $X$: | 4 | 8 | 6 | 8 | 9 | 11 | 7 | 7 | 10 | 10 |
|------|---|---|---|---|---|----|---|---|----|----|
| $Y$: | 6 | 7 | 9 | 10 | 10 | 10 | 11 | 11 | 12 | 14 |

Estimate the simple regression function: $Y_i = \beta_0 + \beta_1 X_i + U_i$ and test the following hypothesis:

Under H$_0$: $\beta_1 = 0$; Against H$_1$: $\beta_1 > 0$

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Where the notations have their usual meaning. Use the z-value at a 5 percent level of significance to conclude.                                                               **[15 M]**

**Q2**: Given the regression specification: $Y_i = \beta_1 + \beta_2 D + U_i$
Where the dependent variable is annual expenditure on food (in thousands of INR), and D is a dummy variable to differentiate between intelligent and foolish persons. Answer the following:
a) What would be the mean food expenditure of an intelligent person?
b) What would be the mean food expenditure of a foolish person?
c) Can we say $\beta_2$ a slope coefficient? Justify.
d) What would be the null and alternate hypothesis $\beta_2$? Interpret it.
e) Consider a specification wherein we assign two dummies for two categories of persons. Will it be acceptable from an econometrician's perspective? Justify.

**[10 M]**

**Q3**:
a) The population regression function for the general linear model in deviation form is given as follows:

$$Y_{n\times1} = X_{n\times2}\beta_{2\times1} + U_{n\times1}$$

Where the variables and parameters have their usual meaning. What happens to the estimated $\beta eta$ coefficients estimated using OLS and their variances if there is perfect multicollinearity of type: $x_1 = 2x_2$?

b) Does the model: $Y_t = \beta_1 + \beta_2 X_t + \beta_3 X_t^2 + U_t$ contain perfect multicolinerity? Substantiate your answer with proper logic.                                    **[15 M]**

**Q4**: Answer the following:
a) Prove that the OLS estimator of coefficients of the simple linear regression model is the best estimator among all other linear and unbiased estimators estimated through any other method.
b) Write down two applications of the Demeaning method used within the OLS method. Explain in detail with the help of suitable specifications and examples.       **[10+10 M]**

**\*\*\*\*\*All the Best\*\*\*\*\*\***