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- b) Double Exponential smoothing
- c) Decomposition of total correlation between direct and indirect effects through Path Analysis. 4+3+3

Ex/PhD/ECO/13/2023

**PH.D. COURSE WORK EXAMINATION 2023**

**ECONOMICS**

**PAPER – 13**

**PAPER : RESEARCH METHODOLOGY IN**

**EMPIRICAL ECONOMICS ]**

Time : 2 hours

Full Marks : 30

Answer question number-1 and *any two* from the rest.

1. Answer any *four* : 2.5×4=10
  - a) Distinguish between Deductive and Inductive Approaches of Research Methodology.
  - b) What are the steps to be followed in Multi-Stage Random Sampling Methods?
  - c) How do you derive the marginal effect of an explanatory variable from the estimated logit model?
  - d) Is Gini Coefficient distribution sensitive? Give reasons in support of your answer.
  - e) What happens to Foster Greer and Thorbecke (FGT) Index if  $\alpha$  tends to infinity?
  - f) Show that Random Walk Process (of a time series data) is non-stationary.
2. a) The variations of productivity of rice is due to different types of fertilizers and different soil conditions. The following results are obtained:

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Sources of variations of productivity	Total Sum of Squares (TTS)	Degrees of freedom (df)
Variations due to fertilizers	103.33	2
Variations due to soil conditions	64.67	4
Error	7.305	8

Given that  $F(2, 8)$  at  $5\%=4.46$  and  $F(4, 8)$  at  $5\%=3.84$

Can we draw conclusion that the differential productivity of a rice is due to fertilizers or soils or both?

b) The test statistic (H) of Kruskal-Wallis (K-W) Non-Parametric Test of ANOVA is given by the following equation:

$$H = \frac{12}{n(n+1)} \sum_{i=1}^c \frac{1}{n_i} \left[ R_i - \frac{n_i(n+1)}{2} \right]^2$$

Show that this expression can be reduced to the following:

$$H = \frac{12}{n(n+1)} \sum_{i=1}^c \frac{R_i^2}{n_i} - 3(n+1)$$

where  $c$  = independent samples (viz. number of columns of the K-W Table), the size of the  $i$ -th sample be  $n_i$ ,  $n = \sum_{i=1}^c n_i$  and  $R_i$  be the observed value

of the rank sum for the  $i$ -th sample. 5+5

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3. i) How do you tackle multicollinearity problem using Principal Component (PC) analysis?
- ii) In a five variables model, three variables appear as statistically significant in the first PC; but these three variables generally do not appear as significant in the 2<sup>nd</sup> PC. What are the underlying reasons for such an outcome?
- iii) How do you obtain eigen value from the PC?
- iv) What is the statistical meaning of the square for the factor loadings of a factor in a particular PC?

3+3+2+2

4. Distinguish between K-Means and Hierarchical Cluster Analysis. Show that K=2 Clustering is stable in the following problems of 4 individuals (A, B, C and D) with two variables ( $X_1$  and  $X_2$ ):

Individuals	$X_1$	$X_2$
A	5	3
B	-1	1
C	1	-2
D	-3	-2

5. Write Notes on:
  - a) Engel-Granger method of Co-integration and Error Correction Mechanism

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