

B.A. (Honours) Examination, 2017
Semester-VI
Economics
Course: H-13
(Quantitative Methods-II)

Time: 3 Hours

Full Marks: 40

Questions are of value as indicated in the margin.

Answer **any four** questions

1. a) Explain the concept of 'random numbers'.
b) If $x_1, x_2, \dots, x_n$ is a simple random sample of size n from a finite population of size N units with mean $\bar{X}$ and variance σ^2 , show that
 - i) $E(\bar{x}) = \bar{X}$ and
 - ii) $Var(\bar{x}) = \frac{\sigma^2}{n}$ in SRSWR
$$= \frac{\sigma^2}{n} \left(\frac{N-n}{N-1} \right)$$
 in SRSWOR,
where $\bar{x}$ is sample mean. 2+8=10
2. a) If X_1, X_2, X_3 be a random sample from $N(0, \sigma^2)$ population, what is the distribution of $(X_1^2 + X_2^2 + X_3^2) / \sigma^2$?
b) If $x_1, x_2, \dots, x_n$ is a simple random sample from a infinite population with variance σ^2 , and $\bar{x}$ is the sample mean, show that $\sum_{i=1}^n (x_i - \bar{x})^2 / n$ is a biased estimator of σ^2 , but bias becomes negligible for large n . Give unbiased estimator of σ^2 here.
c) If T_1 and T_2 be statistics with expectations $E(T_1) = 2\theta_1 + 3\theta_2$ and $E(T_2) = \theta_1 + \theta_2$, find unbiased estimators of parameters θ_1 and θ_2 . 2+6+2=10
3. (a) What is a consistent estimator? What are the necessary and sufficient conditions for consistency?
(b) If $x_1, x_2, \dots, x_n$ is a random sample from $\text{Bin}(m, \theta)$, show that $\sum_{i=1}^n x_i / mn$ is a consistent estimator of θ .
(c) Explain the terms 'Minimum Variance' and 'Minimum Variance Unbiased' estimators. 3+4+3=10
4. (a) What is Neyman-Fisher factorization theorem?
(b) If $x_1, x_2, \dots, x_n$ is a random sample from $N(\mu, \sigma^2)$, where μ is known. Find the sufficient estimator of σ^2 . 5+5=10

P.T.O.

(2)

5. (a) Discuss the general method of the construction of test of hypothesis.
(b) Let P_1 and p_2 be the proportions in two large samples of sizes n_1 and n_2 drawn respectively from two populations. Develop a test for testing whether the proportions in two populations are equal or not. 5+5=10
6. (a) State the assumptions necessary for OLS estimation of the two variable population regression model.
(b) Show how total variation in dependent variable of a linear regression model can be decomposed into two parts – ‘explained variation’ and ‘unexplained’ variation.
(c) Explain how would you assess goodness of fit of an estimated model. 3+4+3=10
7. Consider a two variable population regression model without intercept term. How would you estimate the slope parameter of such model? Can you use the conventional r^2 formula used for the ‘intercept-present’ model to understand the goodness of fit of the ‘no-intercept’ model? 5+5=10
8. Write short notes on the following:
(i) Stratified random sampling
(ii) Type I and Type II error
(iii) Degrees-of-freedom 3+4+3=10
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