

B A (Honours) Examination, 2022
Semester - IV
ECONOMICS
SECC -II
(Statistical Methods II)

Time: 2 Hours

Full Marks: 25

Questions are of value as indicated in margin
Answer any two of the following questions

1. (a) Define joint probability mass function and joint probability density function for two jointly distributed random variables. 3

(b) Joint distribution of X and Y is given by

$$f(x, y) = 4xye^{-(x^2+y^2)}, \quad x \geq 0, y \geq 0$$

Test whether x and y are independent. For the above joint density function, find the conditional distribution of X given Y=y 6.5

(c) Prove that expectation of the product of the two independent jointly distributed random variables is the product of their expectations. 3

2. (a) Find the number of all possible samples of size four from the population of size eight when (i) Sampling is with replacement and (ii) Sampling is without replacement. 4

(b) What is systematic sampling? Compare it with stratified simple random sampling. 8.5

3. (a) If x_i ($i= 1, 2, 3... n$) is a iid observation from a population with unknown parameter θ , prove that $\sum a_i x_i$ is an unbiased estimator of θ if $\sum a_i = 1$. Also prove that the variance of that estimator will be minimum if it is sample mean. *5

(b) If $x_1, x_2, x_3, \dots, x_n$ are iid observations from $N(\mu, 64)$, find the maximum likelihood estimator of population mean μ . 4

(c) Consider two independent random samples drawn from two normal populations $N(\mu_1, \sigma_1)$ and $N(\mu_2, \sigma_2)$ with common unknown variances. Construct 99 % confidence interval and limits for $\mu_1 - \mu_2$. 3.5

4. (a) Give an outline of Neyman- Pearson theory of testing of hypotheses. 8

(b) A random sample of size 20 from a normal population gives a sample mean of 45 and sample variance of 36. Test the hypothesis that the population mean is 50. State clearly the alternative hypothesis you allow for and the level of significance adopted. It is given that $t_{0.025,19} = 2.09$ and $t_{0.005,19} = 2.86$. 4.5