2020

ECONOMICS — HONOURS

Paper : CC-7

(Statistical Methods for Economics)

Full Marks : 65

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

Group - A

1. Answer ***any ten*** questions : 2×10

(a) Are the following data consistent? Give reasons.

Group	Number of observations	Median
I	40	85
II	50	90
Combined	90	69

(b) State whether the following statements are true or false :

(i) *AM* can never be less than *HM*.

(ii) *GM* cannot be computed for a frequency distribution with open-end class.

(c) What do you mean by a relative measure of dispersion?

(d) A distribution has the standard deviation 2. What should be the value of the fourth order central moment such that the distribution in mesokurtic?

(e) Mention some cases where the correlation coefficient may give misleading idea about the relationship between two variables.

(f) State with reasons whether the following statement is True or False :
The regression coefficient of Y on X is 3.1 and that of X on Y is 0.9.

(g) Show that if A and B are two independent events then A^c and B are also independent.

(h) Two letters are drawn at random from the word HOME. Find the probability that one of the letters chosen is M.

(i) For two events A and B, let $P(A) = 0.4$, $P(A \cup B) = 0.7$ and $P(B) =$ p. For what value of p are A and B mutually exclusive?

(j) If a person gets Rs. $(2X + 5)$ where X denotes the number appearing when a balanced die is rolled once, how much money can he expect in the long run per game?

(k) Show that for a random variable X following a binomial distribution with parameters n and p, maximum variance is $n/4$.

(l) Define a standard normal variable. Write down its probability density function.

(m) Show that for two independent random variables (discrete or continuous) $E(XY) = E(X).E(Y)$.

(n) What do you mean by simple random sample with replacement?

(o) What are sampling and non-sampling errors?

Group - B

Answer ***any three*** questions.

2. If the Standard Deviation of 1, 2, ..., n is $\sqrt{14}$, find n. 5

3. Given that $x = 4y + 5$ and $y = kx + 4$ are regression equations of X on Y and of Y on X respectively, show that $0 < k \leq 0.25$. If actually $k = 0.10$, find the means of the variables X and Y and also their coefficient of correlation. 5

4. There are two identical boxes containing respectively 4 white and 3 red balls, and 3 white and 7 red balls. A box is chosen at random and a ball is drawn from it. If the ball is white, what is the probability that it is from the first box? 5

5. The probability that an individual will suffer a bad reaction from a particular injection is 0.001. Determine the probability that out of 2000 individuals (i) exactly 3 and (ii) more than 2 will suffer a bad reaction. [Given $e^{-2} = 0.13534$] 5

6. What do you mean by Stratified Sampling? 5

Group - C

Answer ***any three*** questions.

7. (a) For two observations a and b (a, $b > 0$), show that $AM \geq GM \geq HM$.

(b) Find a suitable measure of central tendency for the following distribution justifying your choice.

Class-limit	Frequency
51 – 55	4
56 – 60	10
61 – 65	14
66 and above	2

5+5

8. (a) If all observations on a variable are equal, then show that all measures of dispersion are zero. Are you surprised by this result? — Why?

(b) The first of the two samples has 100 items with mean 15 and *SD* 3. If the whole group has 250 items with mean 15.6 and *SD* $\sqrt{13.44}$, find the *SD* of the second group. (4+1)+5

9. (a) Consider the sample space $S = \{e_1, e_2, e_3, e_4\}$. Define the events $A = \{e_1, e_3\}$, $B = \{e_2, e_3\}$, $C = \{e_3, e_4\}$.

Are *A, B, C* (i) pairwise independent? (ii) mutually independent? What conclusion can you draw from the answers to (i) and (ii)?

(b) 3 lots contain respectively 10%, 20% and 25% defective articles. One article is drawn at random from each lot. What is the probability that among them there is exactly one defective? (2+1+1)+6

10. (a) 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.

(b) The mean yield per plant for 11 tomato plants of a particular variety was found to be 1200 gm with a *SD* of 90 gm. Set up 99% confidence limits to the mean yield of all plants of this variety assuming that yield per plant follows normal distribution.

Given that $Z_{.005} = 2.58$ $t_{.005,\,10} = 3.169$ $t_{.005,\,11} = 3.106$. 4+6

11. (a) Argue whether the following statement is true or false: If H_0 is accepted at α_1% level of significance, then it will definitely be accepted at α_2% level of significance, where $\alpha_1 < \alpha_2$.

(b) Suppose that a random sample of size 9, drawn from a normal population with SD 6, has mean 52. Test H_0: $\mu = 55$ ag H_1: $\mu \neq 55$ at 1% level.

Given that $Z_{.005} = 2.58$, $t_{.005,8} = 3.355$. $t_{.005,9} = 3.250$. 5+5