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961 (SM)

[20-HKPGDEN-M2S(N)21J]

MA 2nd Semester (New) Exam., 2020

ECONOMICS

[PGEC (S2) 03]

(Statistical Methods for Economic Analysis)

Full Marks : 80

Time : 3 hours

The figures in the margin indicate full marks for the questions

1. *(a)* Answer the following questions : 1×8=8

(i) For any finite number of positive values of a variable, state the relationship among arithmetic mean (AM), geometric mean (GM) and harmonic mean (HM).

(ii) What is single regression?

(iii) Define impossible event.

(iv) What is probability density function (PDF)?

(v) What is meant by coefficient of quartile deviation (QD)?

(vi) Define unbiased estimator of a parameter.

(vii) Write the formula of Paasche's quantity index number.

(viii) Write the condition for which the *t*-distribution is unimodal.

(b) Select the correct answer from the following : 1×4=4

(i) The algebraic sum of deviation of a set of observations from their arithmetic mean is

(1) zero

(2) minimum

(3) maximum

(4) negative quantity

(ii) If each observation of a set of series is divided by 6, then the SD of new observations is

(1) $\frac{1}{12}$th of the original observations

(2) 6 times of SD of the original observations

(3) not changed

(4) $\frac{1}{6}$th of SD of the original observations

(iii) If one regression coefficient is greater than unity, then the other one must be

(1) greater than unity

(2) less than unity

(3) equal to unity

(4) equal to zero

(iv) For a symmetrical distribution, all moments of odd order are

(1) positive

(2) negative

(3) zero

(4) greater than zero

(Continued)

(c) Fill in the blanks : 1×4=4

(i) For a Poisson distribution, mean is _____ to variance.

(ii) If all the units of the population are enumerated, then it is called _____.

(iii) Type II error is the probability of accepting the null hypothesis when it is _____.

(iv) A consistent estimator is _____ unique.

2. Answer the following questions (any *five*) : 2×5=10

(a) Distinguish between causation and correlation with suitable examples.

(b) Mention in brief the properties of a good measure of dispersion.

(c) What are the advantages and disadvantages of stratified random sampling?

(d) Write a short note on log-normal distribution.

(e) Prove that in sampling from an $N(\mu, \sigma^2)$ population, the sample mean is a consistent estimator of μ.

(f) For two events A and B, let $P(A) = 0{\cdot}4$, $P(A \cap B) = 0{\cdot}58$ and $P(B) = 0{\cdot}3$. Check whether A and B are independent or not.

3. Answer the following questions (any *four*) : 3×4=12

(a) Define weighted average. Distinguish between a simple average and a weighted average.

(b) Prove that if A and B are independent events, then $\overline{A}$ and $\overline{B}$ are also independent events.

(c) 1000 lightbulbs with a mean life of 120 days are installed in a new factory and their length of life is normally distributed with SD of 20 days. How many bulbs will expire in less than 100 days?

(d) Write in brief about consistent estimator. Do consistency and unbiasedness in estimates necessarily go together?

(e) A random variable X has the following probability distribution :

X :	−2	−1	0	1	2	3
$P(X)$:	0·1	0·1	0·2	0·2	0·3	0·1

Calculate $E(X)$ and $V(X)$.

4. Answer the following questions (any *three*) : 6×3=18

(a) Define random variable. A random variable X has the following probability distribution :

x :	−2	−1	0	1	2	3
$f(x)$:	0·1	$2k$	0·2	$2k$	0·3	$2k$

Find the value of k.

(b) Discuss the step deviation method of calculating arithmetic mean with suitable example. Mention the advantages of this method.

(c) Describe the different sources of errors in sample survey.

(d) Give the statement of weak law of large numbers. If X_i assumes values i and $-i$ with equal probability, then show that weak law of large numbers cannot be applied to independent values $X_1, X_2, ..., X_n$.

(Continued)

5. Answer the following questions (any *three*) : 8×3=24

(a) Given the bivariate data :

x	:	2	4	5	6	8	11
y	:	18	12	10	8	7	5

Fit the regression line of Y on X and regression line of X on Y. Hence, calculate Karl Pearson's correlation coefficient.

(b) The prices and quantity of five commodities are given in the table below. Taking 2000 as base year, compute value index number using simple aggregate method :

Commodities	*2000*		*2002*	
	Price (₹)	*Quantity* (kg)	*Price* (₹)	*Quantity* (kg)
A	400	10	700	12
B	800	15	1,905	17
C	100	5	125	5
D	140	7	160	7
E	300	6	400	6

(c) The sales data of an item in six shops before and after a special promotional campaign are as under :

Shops	*A*	*B*	*C*	*D*	*E*	*F*
Before campaign	35	28	31	48	50	42
After campaign	58	29	30	55	56	45

Can the campaign be judged to be a success? Test at 5% level of significance.

(Significant values of (t) at 1% and 5% level for 5 d.t. respectively are 2·015 and 2·571.)

(d) Discuss the various steps involved in testing of hypothesis.

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