2014

ECONOMICS

(Major)

Paper : 5.2

Full Marks : 60

Time : 3 hours

The figures in the margin indicate full marks for the questions

(For Arts Stream)

(Basic Statistics)

1. *(a)* Choose the correct answer : 1×3=3

(i) If x and y are two random variables, there can be at most —— (one / two / three) regression line(s).

(ii) If $P(A) = P(B)$, then the two events A and B are —— (independent / dependent / equally likely).

(iii) The relation among arithmetic mean, geometric mean and harmonic mean is —— (AM>GM>HM / AM>HM>GM / AM=HM=GM / HM>GM>AM).

(b) State whether the following statements are *True* or *False* : 1×4=4

(i) The algebraic sum of deviations taken from any central value is always zero.

(ii) If each observation of a set is divided by 2, then the mean of the new set will be same as the original mean.

(iii) A high degree of correlation means that the cause and effect relationship exists between the two correlated variables.

(iv) In normal distribution, mean = median = mode.

2. Answer the following questions : 2×4=8

(a) If the mean is 5 and the median is 6, calculate the mode.

(b) It is given that $P(A) = 0 \cdot 40$ and $P(B) = 0 \cdot 35$. If the events are independent, calculate $P(A \cup B)$.

(c) What do you understand by mean deviation?

(d) For a distribution, the coefficient of variation is 22·5% and the value of the arithmetic mean is 7·5. Find the value of the standard deviation.

3. Answer the following questions (any *three*) : 5×3=15

(a) What do you mean by regression? Why are there two regression lines in case of a bivariate series? 2+3=5

(b) A bag contains 3 red, 6 white and 7 blue balls. Two balls are drawn at random. What is the probability that out of 2 balls, one is red and other is blue? 5

(c) Explain why standard deviation is regarded superior to other means of dispersion. 5

(d) Show that Karl Pearson's coefficient of correlation is independent of the change of origin and scale of the concerned variables. 5

(e) In a test series involving India, Virat Kohli and Rohit Sharma made the following scores :

Players	1st Test		2nd Test		3rd Test	
	1st Innings	2nd Innings	1st Innings	2nd Innings	1st Innings	2nd Innings
Virat Kohli	34	7	26	201	56	12
Rohit Sharma	67	35	42	39	47	51

Identify the better and the more consistent batsman in the series. 5

4. Answer the following questions (any *three*) : 10×3=30

(a) What are the requisites for an 'ideal' measure of central tendency? Calculate the mean and standard deviation of the following frequency distribution of marks in a class : 4+6=10

Marks	:	0–10	10–20	20–30	30–40	40–50	50–60	60–70
No. of Students	:	4	13	18	30	15	12	8

(b) (i) When are two variables said to be correlated? Distinguish between linear and non-linear correlations.

(ii) In trying to evaluate the effectiveness in its advertisement expenditure, a firm compiled the following information :

Year	2003	2004	2005	2006	2007	2008	2009	2010
Advertisement Expenditure (₹ in '000)	12	15	15	23	24	38	42	48
Sales (₹ in lakh)	5·0	5·6	5·8	7·0	7·2	8·8	9·2	9·5

Estimate the regression equation of sales on advertising expenditure. Also estimate the likely sales when advertising expenditure is ₹ 60,000. 4+6=10

(c) (i) Distinguish between absolute and relative measures of dispersion. In what situation relative measures are used?

(ii) A survey of domestic consumption of electricity gave the following distribution of units consumed :

No. of Units	:	Below 100	100–200	200–300	300–400
No. of Consumers	:	9	18	27	32
No. of Units	:	400–500	500–600	600–700	700 and above
No. of Consumers	:	45	38	20	11

Compute the quartile deviation and its coefficient. 4+6=10

(d) What do you understand by binomial distribution? What are its main features? For a binomial distribution, mean = 7 and variance = 11. Give your comment whether the statement is right or wrong. 3+4+3=10

(e) (i) State and prove the multiplicative law of probability.

(ii) For events A and B, if $P(A) = \frac{1}{4}$, $P(B) = \frac{2}{5}$, $P(A \cup B) = \frac{1}{2}$, then find $P(A \cap B)$ and $P(B / A)$. 4+6=10

(f) What do you mean by normal distribution? Write different properties and importance of normal distribution. 2+5+3=10

(For Science Stream)

(Elementary Econometrics)

5. Answer the following questions : 1×7=7

(a) Define degrees of freedom.

(b) State the general relationship between consumption C and disposable income Y in stochastic form.

(c) Name the error of accepting a false hypothesis.

(d) Mention one test that is used for testing small samples.

(e) How is 'bias' defined in econometrics?

(f) Which variables are known as 'controlled variables'?

(g) Name the problem that arises in the estimation of a linear regression model when the assumption of $E(u_i^2) = \sigma^2$ is violated.

6. Answer the following questions (any *four*) : 2×4=8

(a) Distinguish between 'estimate' and 'estimator'.

(b) Comment on the following :

For a binomial distribution, mean = 7 and variance = 11.

(c) Write two measures of 'goodness of fit'.

(d) If a random variable X follows the Poisson distribution pattern such that $P(X = 1) = P(X = 2)$, find the mean of the distribution.

(e) What are the critical values of Z at 1% and 5% levels of significance for a two-tailed normal test?

(f) How do you interpret the 'intercept term' in a two-variable linear regression model?

7. Answer the following questions (any *three*) : 5×3=15

(a) In a two-variable linear regression model, show how the sum of the squares is decomposed to obtain the coefficient of determination. 5

(b) Given $r_{12} = 0 \cdot 65$, $r_{13} = 0 \cdot 60$ and $r_{23} = 0 \cdot 90$, calculate the value of the partial correlation coefficient $r_{12 \cdot 3}$. 5

(c) Outline the principle of maximum likelihood method of estimation. 5

(d) What are the criteria for a good estimator? Show that the sample mean based on a simple random sample with replacement is an unbiased estimator of the population mean. 2+3=5

(e) State the assumptions of the three-variable linear regression model

$$Y_i = b_0 + b_1 X_{1i} + b_2 X_{2i} + u_i$$

Interpret the meaning of b_0, b_1 and b_2. 2+3=5

8. Answer the following questions (any *three*) : 10×3=30

(a) The intelligent quotients (IQs) of 16 students from one area of a city showed a mean of 107 and a standard deviation of 10, while the IQs of 14 students from another area of the city showed a mean of 112 and a standard deviation of 8. Is there a significant difference between the IQs of the two groups at significant level of *(i)* 0·01 and *(ii)* 0·05?

[$t_{0·01} = 2·76$ for 28 degrees of freedom (d.f.) and $t_{0·05} = 2·05$ for 28 d.f.] 10

(b) Prove that ordinary least squares estimators are Best Linear Unbiased Estimators (BLUE). 10

(c) Discuss the problems associated with violation of classical least squares assumptions. 10

(d) A die is thrown 60 times with the following results :

Face	:	1	2	3	4	5	6	*Total*
Frequency	:	6	10	8	13	11	12	60

Are the data consistent with the hypothesis that the die is unbiased?

[$\chi^2_{0·01} = 15·09$ for 5 d.f.] 10

(*Continued*)

(e) What is probability density function? Define normal distribution and the standard normal distribution. The average marks in a particular class is 79. The standard deviation is 5. If the marks are distributed normally, how many students in a class of 200 did not receive marks between 75 and 82?

[$P \le Z \le 0·8 = 0·2881$

$P \le Z \le 0·6 = 0·2257$

where Z is a standard normal variate] 2+3+5=10

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