

PG Odd Semester (CBCS) Exam., December—2016

ECONOMICS

(1st Semester)

Course No. : ECOCC-104

(Statistics for Economists)

Full Marks : 70

Pass Marks : 28

Time : 3 hours

The figures in the margin indicate full marks for the questions

Answer **five** questions, selecting **one** from each Unit

UNIT—I

1. (a) Give two examples of spurious correlation. 2
- (b) Obtain the least square estimators of a three-variable linear regression model. 8
- (c) Given $r_{12} = 0.65$, $r_{13} = 0.60$ and $r_{23} = 0.90$, calculate the values of $r_{12.3}$ and $R_{1.23}$ (the symbols have their usual meanings). 4

2. (a) Show that $1 - R_{1.23}^2 = (1 - r_{12}^2)(1 - r_{13.2}^2)$, where the symbols have their usual meanings. 4
- (b) Do you agree with the view that a high positive value of r between the increase in cigarette smoking and increase in lung cancer establishes that cigarette smoking is responsible for lung cancer? Justify your answer. 2
- (c) From the following data, calculate the values of regression coefficients of Y on X and X on Y and also the value of correlation coefficient between X and Y :
 $2+2+2=6$
- | | | | | | |
|-------|--------|-------|-------|---------|--------|
| X | 580, | Y | 370, | XY | 11494, |
| X^2 | 41658, | Y^2 | 17206 | and n | 12 |
- (d) Find the harmonic mean of regression coefficients in case of positively and perfectly correlated variables. 2

UNIT—II

3. (a) State and prove Bayes' theorem of probability. 3
- (b) A continuous random variable X is distributed over the interval $[0, 1]$ with p.d.f. $f(x) = ax^2 + bx$, where a and b are constants. If the arithmetic mean of X is 0.5, find the values of a and b . 4

(3)

- (c) If X is normally distributed with mean 16 and standard deviation 4, then find the points of inflexion of the normal curve. 2
- (d) Derive the mean of the Binomial distribution. 5
4. (a) State and prove multiplicative theorem of probability. 3
- (b) A continuous random variable X has the distribution function
- $$F(x) = \begin{cases} k(x-1)^4; & 1 \leq x \leq 3 \\ 0 & ; \text{ otherwise} \end{cases}$$
- Find—
- (i) the probability density function $f(x)$;
(ii) the value of the constant k . 2+2=4
- (c) If X and Y are two independent random variables, then show that
- $$V(aX + bY) = a^2 \cdot V(X) + b^2 \cdot V(Y)$$
- where a and b are two constants. 3
- (d) Define moment generating function. Show that moment generating function of the sum of the two independent random variables is equal to the product of their individual moment generating functions. 1+3=4

(4)

UNIT—III

5. (a) Define sampling distribution of a statistic. Show that sample mean is an unbiased estimator of population mean. 2+4=6
- (b) Distinguish between multiphase sampling and multistage sampling. 3
- (c) A population consists of 4 units viz. 2, 4, 6 and 8. Draw all possible samples of size 2 in case of SRSWOR and calculate their sample means. Also find the mean and standard error of the sampling distribution of the sample means in case of SRSWOR. 2+3=5
6. (a) Discuss the advantages and disadvantages of simple random sampling. 4
- (b) Derive the standard error of sample mean in case of SRSWOR. 6
- (c) A population consists of 4 units viz., 1, 3, 4 and 6. Draw all possible simple random samples of size 2 in case of SRSWOR and compute their means. Verify that $E(\bar{x}) = \mu$, where the symbols have their usual meanings. 2+2=4

UNIT—IV

7. (a) Write short notes on the following :
3+3+3=9

(i) Null hypothesis and alternative hypothesis

(ii) Applications of Student's *t*-test

(iii) Type-I error and Type-II error

(b) A manufacturer claims that the life time of a certain brand of batteries produced by his factory has a variance of 5000 hours. A sample of 26 batteries is tested to verify manufacturer's claim. It is found that the variance life time of these 26 samples of batteries is 7200 hours. Test at 5% level of significance, whether variance life time of batteries is significantly different from 5000 hours or not. 5

8. (a) Distinguish between one-tailed test and two-tailed test. Discuss the applications of large sample test. 2+3=5

(b) Discuss the procedure of hypothesis testing for testing the significance of sample correlation coefficient in case of large samples. 5

(c) A random sample of 150 tins of Vanaspati oil gave an average weight of 4.925 kg with a standard deviation of 0.2 kg. Based on these values, can we accept the hypothesis of net weight of 5 kg per tin at 5% level of significance? 4

UNIT—V

9. (a) Define analysis of variance. 2

(b) Describe the technique of analysis of variance in two-way classified data, stating clearly the mathematical model and the assumptions you make by giving analysis of variance table. 10

(c) What will happen in analysis of variance if the normality assumption of the error term is violated? Discuss. 2

10. (a) Discuss the advantages and disadvantages of non-parametric tests. 3+3=6

(b) A panel of judges A and B have independently awarded the following marks to the seven debaters :

Debaters		1	2	3	4	5	6	7
Marks by Judge A	:	40	34	58	30	40	48	42
Marks by Judge B	:	32	39	26	30	38	34	28

Calculate Spearman's rank correlation coefficient and test its significance at 5% level of significance. 4+4=8
