M.Com. 1st Semester Examination, 2012

BASIC STATISTICS

PAPER—COM-102

Full Marks : 50

Time : 2 hours

The figures in the right-hand margin indicate marks

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

Illustrate the answers wherever necessary

Notions have their usual meaning

UNIT – I

[*Marks* : 20]

1. Answer any *two* questions from the following : 5×2

    (a) For regression equation of y on x, show that : 5

    $$TSS = ESS + RSS$$

(b) The simple correlation coefficients between temperature (X_1), corn yield (X_2) and rainfall (X_3) are :

$$r_{12} = 0 \cdot 59, \quad r_{13} = 0 \cdot 46 \text{ and } r_{23} = 0 \cdot 77.$$

    (i) Calculate the partial correlation coefficient between temperature and corn yield;

    (ii) Calculate the multiple correlation between corn yield and temperature, rainfall. $2\frac{1}{2} \times 2$

(c) If two events A and B are independent, show that : $2\frac{1}{2} \times 2$

    (i) A' and B'

    (ii) A' and B are also independent.

(d) A box contains 4 notes of Rs. 10, Rs. 20, Rs. 50 and Rs. 100. Another box contains 6 notes of Rs. 5, Rs. 10, Rs. 20, Rs. 50, Rs. 100 and Rs. 500. A boy selects one box at random and then draws a note from the selected box to purchase a toy. Find the probability that the boy will be able to purchase the toy, if its price is Rs. 100.   5

2. Answer any *one* question from the following : 10×1

   (*a*) (*i*) Show that like product-moment correlation coefficient, Spearman's rank correlation coefficient also his between -1 and $+1$.

      (*ii*) Ten hand-writings were ranked by two judges in a competition. The rankings are given below. Calculate Kendall's τ (tau) to measure the closeness of rankings. $5 + 5$

Hand-writing

	A	B	C	D	E	F	G	H	I	J
Judge-I :	3	8	5·5	4	7	10	1	2	5·5	9
Judge-II :	6	4	7	5	10	3	2	1	9	8

   (*b*) (*i*) There are *n* balls numbered as 1, 2, 3, ... *n* and also *n* cells numbered as 1, 2, 3, ... *n*. The balls are distributed over the cells, one ball being allotted to each cell. Find the probability that none of the balls occupies its respective cell.

      (*ii*) 6 keys of 6 new bykes are kept in a box. If 6 men took 6 keys at random and try to start the bykes individually then find the probability that

        (*A*) Exactly 2 bykes will start

        (*B*) At least one byke will start. $6 + 4$

UNIT — II

[*Marks* : 20]

3. Answer any *two* of the following : 5×2

   (*a*) (*i*) Write the essential features of Trend component in time series analysis.

   (*ii*) You are given that

   $$y = 500 + 8t + \cdot 5t^2$$

   (origin : year 2012, *t* unit = 1 year and *y* = Annual production of sugar in tonnes) shift the origin to year 2010. $2 + 3$

   (*b*) Determine the relative importance of food group.

Group of Items	% increase in expenditure	Proportion of expenditure
Food	125	52 %
Clothing	75	8 %
Fuel and lighting	55	10 %
Housing	150	14 %
Miscellaneous	50	16 %

   Calculate cost of living index number of the group. 5

(c) There were 400 students in M. Com. in distance education of Vidyasagar University. Their results in various semesters are given below :

    180 passed in first semester

    140 passed in second semester

    180 passed in third semester

    60 passed in all semesters

    80 failed in all semesters

40 passed in the first and second semesters but failed in third semester, 70 failed in the first and second semesters but passed in the third semester.

    Find out how many students passed at least two examinations.

(d) In association of attributes show that

$$Q = \frac{2\gamma}{1 + \gamma^2}$$

where Q = Yule's co-efficient of association

γ = Co-efficient of colligation.

4. Answer any *one* of the following : 10 × 1

   (a) Calculate seasonal indices by the ratio to moving average method from the following data : 10

   Wheat prices in rupees per 10 quintals

Year→ Quarter ↓	2009	2010	2011
I	86	90	100
II	75	72	78
III	65	66	72
IV	80	85	93

   (b) If x_i = Price relative = $\frac{P_{1i}}{P_{0i}}$; y_i = Quantity relative = $\frac{Q_{1i}}{Q_{0i}}$; w_i = Weight = Base year value = $P_{0i} \cdot Q_{0i}$ where $i = 1, 2, 3,..., n$ then show that

   $$\frac{P_{10}^L}{P_{10}^P} = 1 - \frac{r_{xy}\sigma_x\sigma_y}{V_{10}}$$

P_{10}^{L} represents Price Index of Laspeyer's

P_{10}^{P} represents Price Index of Paaschees

V_{10} represents value index.

Also state when Laspeyer's Price Index will be more than, less than or equal to Paaschee's Price Index. $\qquad$ 7 + 3

[*Internal Assessment* : 10 Marks]