

B.A. (Honours) Examination, 2018
Semester-II
Integrated Mathematics and Statistics
Paper: S-1.2.5.P.2 (Subsidiary) (Old Syllabus)

Time: Three Hours

Full Marks: 40

Questions are of value as indicated in the margin

1. (a) What is a scatter diagram? Draw scatter diagrams showing different types and degrees of correlation.
- (b) Prove that the correlation coefficient(r) lies between -1 and $+1$ 5+5=10
2. (a) n pairs of values of two variables x and y are given. The variances of x , y and $x-y$ are σ_x^2, σ_y^2 and σ_{x-y}^2 respectively. Show that the correlation coefficient r_{xy} between x and y is given by $\frac{\sigma_x^2 + \sigma_y^2 - \sigma_{x-y}^2}{2\sigma_x\sigma_y}$

- (b) Find the coefficient of correlation from the following data: 5+5=10

| | | | | | | | | |
|---|----|----|----|----|----|----|----|----|
| X | 65 | 63 | 67 | 64 | 68 | 62 | 70 | 66 |
| Y | 68 | 66 | 68 | 65 | 69 | 66 | 68 | 65 |

3. (a) Find the regression of x on y from the following data:

$$\sum x = 24 \quad \sum y = 44 \quad \sum xy = 306$$

$$\sum x^2 = 164 \quad \sum y^2 = 574 \quad n = 4$$

Find the estimated value of x when $y=6$.

- (b) Two positively correlated variables x_1 and x_2 have variances σ_1^2 and σ_2^2 respectively. Determine the value of the constant ' a ' such that $x_1 + ax_2$ and $x_1 + \frac{\sigma_1}{\sigma_2}x_2$ are uncorrelated. 5+5=10

4. (a) In a contest two judges ranked eight candidates A B C D E F G and H in order of their preferences as shown in the following table find the rank correlation coefficient.

| | | | | | | | | |
|----------|---|---|---|---|---|---|---|---|
| Judge-I | 5 | 2 | 8 | 1 | 4 | 6 | 3 | 7 |
| Judge-II | 4 | 5 | 7 | 3 | 2 | 8 | 1 | 6 |

- (b) Equations of two regression lines are $y=32-x$ and $x=13-0.25y$. Identify the regression lines as y on x and x on y . 6+4=10

P.T.O.

(2)

5. (a) Define an Index Number.
(b) Why do we need an Index Number?
(c) Discuss on the formula that is used to calculate the price Index Number by
(i) Paasche's Method (ii) Laspayers Method. 2+2+6=10

6. (a) Explain the concepts of Test of Index numbers.
(b) Using the following data, verify that Laspayer's formula does not satisfy Reversal Test: 4+6=10

| Commodity | 1979 | | 1980 | |
|-----------|-------|----------|-------|----------|
| | Price | Quantity | Price | Quantity |
| Rice | 32 | 50 | 30 | 50 |
| Barley | 30 | 35 | 25 | 40 |
| Maize | 16 | 55 | 18 | 50 |

7. (a) Discuss briefly the different components of a time series.
(b) Assuming a four yearly cycle calculate the trend by the method of moving averages from the following data relating to the production of tea in India.

| Year | 1941 | 1942 | 1943 | 1944 | 1945 | 1946 | 1947 | 1948 | 1949 | 1950 |
|------------------|------|------|------|------|------|------|------|------|------|------|
| Production Tonne | 464 | 515 | 518 | 467 | 502 | 540 | 557 | 571 | 586 | 612 |

4+6=10

8. (a) Fit a suitable straight line to the following data by the method of least squares.

| Year | 1959 | 1960 | 1961 | 1962 | 1963 |
|---------------------|------|------|------|------|------|
| % of Insured People | 11.3 | 13 | 9.7 | 10.6 | 10.7 |

- (b) With what characteristic component of time series should each of the following be associated?
(i) An upturn in business activity
(ii) General Increase in sales of TV sets
(iii) Increase in sales of AC machine
(iv) Increase in garment sales in April 6+4=10