# 2016

## STATISTICS

( General )

**( Practical )**

**SET—II**

*Full Marks* : 100

*Time* : 4 hours

*The figures in the margin indicate full marks for the questions*

GROUP—A

Answer *any* **three** questions

**1.** *(a)* From a sample of 200 pairs of observations, the following results are obtained :

$\Sigma X = 11 \cdot 34$, $\Sigma Y = 20 \cdot 72$, $\Sigma X^2 = 12 \cdot 16$, $\Sigma Y^2 = 84 \cdot 96$, $\Sigma XY = 22 \cdot 13$

Estimate the two-variable linear regression model $Y = \alpha + \beta X$ and test the null hypothesis $H_0 : \beta = 0$ against $H_1 : \beta \neq 0$.

*(b)* For 24 pairs of sample values of $X$ and $Y$ where $X$ is independent and $Y$ is dependent variable, the following results are given :

$$\bar{X} = 0 \cdot 6225$$

$$\bar{Y} = 25 \cdot 79$$

$$\Sigma(X - \bar{X})^2 = 3 \cdot 3276$$

$$\Sigma(Y - \bar{Y})^2 = 1211 \cdot 96$$

$$\Sigma(X - \bar{X})(Y - \bar{Y}) = 40 \cdot 22$$

Set up the AOV table for the regression analysis. Also test the hypothesis that the population regression coefficient $\beta = 0$, given that $F_{0 \cdot 05}(1, 22) = 4 \cdot 30$ and $F_{0 \cdot 01}(1, 22) = 7 \cdot 95$. 20

**2.** *(a)* A machine is manufacturing mica discs with specified thicknesses between 0·008″ and 0·015″. Samples of size $L_i$ are drawn every hour and their thicknesses in units (1 unit = 0·001″) are recorded in the following table. Set up the $R$-chart and $\bar{X}$-chart. Plot the





observed points and comment on the same :

| *Sample No.* | *Thickness of mica discs* (1 unit = 0·001″) | | | |
|---|---|---|---|---|
| 1 | 14 | 8 | 12 | 12 |
| 2 | 11 | 10 | 13 | 8 |
| 3 | 11 | 12 | 16 | 13 |
| 4 | 15 | 12 | 14 | 11 |
| 5 | 10 | 10 | 8 | 8 |

*(b)* Construct an appropriate control chart for the following data and comment on it :

| *Lot No.* | *No. of inspected* | *No. of defective* |
|---|---|---|
| 1 | 500 | 25 |
| 2 | 400 | 42 |
| 3 | 300 | 35 |
| 4 | 150 | 16 |
| 5 | 600 | 15 |
| 6 | 450 | 40 |
| 7 | 750 | 72 |
| 8 | 800 | 81 |
| 9 | 900 | 82 |
| 10 | 1000 | 100 |

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3. *(a)* Index numbers of demands for agricultural products ($y$) and the prices of agricultural products ($x$) are given below for the year 1950–1959. Fit a demand curve and hence obtain the price elasticity of demand assuming the following function :

$$y = ax^{\beta}$$

| *Year* | $Y = y$ | $X = x$ |
|---|---|---|
| 1950 | 102 | 89 |
| 1951 | 98 | 99 |
| 1952 | 100 | 100 |
| 1953 | 105 | 91 |
| 1954 | 117 | 93 |
| 1955 | 120 | 72 |
| 1956 | 120 | 75 |
| 1957 | 127 | 91 |
| 1958 | 118 | 91 |
| 1959 | 134 | 96 |

*(b)* Fit a Pareto's curve to the following data :

| *Income* (less than) | *No. of persons* |
|---|---|
| 100 | 240 |
| 100–500 | 160 |
| 500–1000 | 82 |
| 1000–2000 | 53 |
| 2000–3000 | 25 |

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4. The following data describe the number of missing rivets in Airplane. Construct $C$-chart for the data : 20

| *Airplane Number* | *No. of missing rivets* |
|---|---|
| 201 | 8 |
| 202 | 16 |
| 203 | 14 |
| 204 | 19 |
| 205 | 11 |
| 206 | 15 |
| 207 | 8 |
| 208 | 11 |
| 209 | 21 |
| 210 | 12 |
| 211 | 23 |
| 212 | 16 |
| 213 | 9 |
| 214 | 25 |
| 215 | 15 |
| 216 | 9 |
| 217 | 9 |
| 218 | 14 |
| 219 | 11 |
| 220 | 9 |

**5.** Let the demand function be of the form $D = Ax^{\alpha}y$, where $D$ = demand for imports, $x$ = national income, $y$ = price index of imports. Calculate the income and price elasticities for imports. The data is as follows : 20

| *Year* | *National Income* | *Price* | *Quantity of Imports* |
|---|---|---|---|
| 1 | 7·24 | 3·99 | 110·10 |
| 2 | 7·71 | 4·61 | 112·20 |
| 3 | 8·36 | 5·00 | 103·00 |
| 4 | 9·25 | 4·84 | 106·70 |
| 5 | 10·08 | 4·56 | 109·50 |
| 6 | 10·91 | 4·47 | 116·90 |
| 7 | 11·61 | 4·51 | 118·40 |
| 8 | 12·53 | 4·18 | 125·40 |
| 9 | 13·34 | 3·95 | 126·60 |
| 10 | 14·11 | 3·90 | 120·30 |
| 11 | 14·67 | 3·66 | 108·20 |

GROUP—B

**6.** Practical Notebook. 10

**7.** Viva voce. 10

**8.** Internal Assessment. 20

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