

Paper II : Applied Statistics

Section—A

$$1 \times 10 = 10/1/2 \times 10 = 5$$

1. The modified exponential curve is defined as :

(a) $U_t = abc^t$ (b) $U_t = \left(\frac{k}{1 + e^{at}} \right)$ (c) $U_t = a + bc^t$ (d) $\frac{k}{1 + e^{a+bt}}$

2. The period of cyclic variation is :

- (a) 6 months (b) Less than one year
(c) greater than one year (d) 9 months.

3. The serial correlation of order k for the auto-regressive series $U_{t+1} = aU_t + \varepsilon_t$, $|a| < 1$ is given by :

(a) $r_k = a^k$ (b) $r_k = 0$ (c) $r_k = 1$ (d) $r_k = a^{2+k}$

4. The formula to calculate the control limits for C-chart when standards are known is :

(a) $\lambda_0 \pm 2\sqrt{\lambda_0}$ (b) $\lambda_0 \pm 3\sqrt{\lambda_0}$ (c) $\lambda_0 \pm 6\sqrt{\lambda_0}$ (d) $\lambda_0 \pm \sqrt{\lambda_0}$

5. \bar{X} chart is a control chart used for :

- (a) Variables (b) Attributes
(c) Fraction-defective (d) None of these.

6. Let P_{Oi}^{La} and P_{Oi}^{Pa} respectively stand for Laspeyre's and Paasche's index numbers. Then Fisher's index number is given by :

(a) $P_{Oi}^F = \frac{P_{Oi}^{La} + P_{Oi}^{Pa}}{2}$ (b) $P_{Oi}^F = \sqrt{P_{Oi}^{La} \times P_{Oi}^{Pa}}$
(c) $P_{Oi}^F = \frac{1}{P_{Oi}^{La}} + \frac{1}{P_{Oi}^{Pa}}$ (d) $P_{Oi}^F = \frac{P_{Oi}^{La}}{P_{Oi}^{Pa}}$

7. Let the raw scores X in a test is such that $E(X) = 10$ and S.D. $(X) = 16$. The σ -score Z corresponding to the raw score X is given by :

(a) $Z = 10X + 10$ (b) $Z = \frac{X - 16}{10}$
(c) $Z = \frac{X - 10}{16}$ (d) $Z = 16X + 10$

8. The reliability coefficient for double length test is given by :

(a) $r_{22} = \frac{r_{11}}{1 + r_{11}}$ (b) $r_{22} = \frac{2r_{11}}{2 + r_{11}}$ (c) $r_{22} = \frac{2r_{11}}{1 + r_{11}}$ (d) $r_{22} = 2r_{11}$

9. Let i_x stands for the annual age-specific fertility rate. Then the Total Fertility rate is given by :

(a) $\sum_{x=1}^{50} i_x$ (b) $\sum_{x=15}^{90} i_x$ (c) $\sum_{x=15}^{49} i_x$ (d) $\sum_{x=28}^{49} i_x$

10. An approximate relationship between the Gross Reproduction Rate (G.R.R.) and Total Fertility Rate (T.F.R.) is given by :

- (a) $G.R.R. = \frac{\text{Number of male births}}{\text{Total number of births}} \times T.F.R.$
 (b) $G.R.R. = \frac{\text{Number of female births}}{\text{Total number of births}} \times T.F.R.$
 (c) $G.R.R. = \text{Number of female births} \times T.F.R.$
 (d) $G.R.R. = \text{Total number of births} \times T.F.R.$

Section—B

$$2 \times 5 = 10/1 \times 5 = 5$$

1. Write down the form of additive model of time series.
2. Write down the general form of index number based on weighted aggregate.
3. A given test has a reliability coefficient of 0.81. What is the maximum correlation which this test is capable of yielding as it stands ?
4. Define Producer's Risk.
5. Explain OC function.
6. Define Age-specific Death Rate.
7. Define Gross Reproduction Rate.
8. Write down formula for Paasche's index number.
9. Define Normalized Scores.
10. Write down the form of Logistic Curve.

Section—C

$$10 \times 3 = 30/5 \times 3 = 15$$

1. Describe various components of complete life table.
2. Below are given the figures of production (in thousand quintals) of a sugar factory :

Year	: 1963	1965	1966	1967	1968	1969	1972
Production	: 67	88	94	85	91	98	90

3. A test is administered on 400 pupils. It gave mean 60 and standard deviation 12. Complete the following table of equivalent raw scores :

Raw Score	: 84	78	72	66	60	54	48	42	36
σ -Score	: —	—	1	—	0	—	—	—	—
Standard Score	: —	—	—	—	—	40	—	—	—

4. Plot the operating characteristic curve for single sampling plan where $N = 5000$; $n = 100$; $C = 1$. Assuming $P_c = 0.10$ determine the lot tolerance fraction defective. For the data as above, plot the average outgoing quality (AOQ) curve and determine AOQL.

5. Define Fisher's index number and Drobish-Bowley price index number. Which of these two index numbers satisfies the Time reversal and Factor reversal tests. Justify your answer.