

FS – 26 / 15-16

Statistics

Paper – II

Time : 3 hours

Full Marks : 200

The figures in the right-hand margin indicate marks.

Candidates should attempt Q. No. 1 from

Section – A and Q. No. 5 from Section – B

*which are compulsory and any **three** of*

the remaining questions, selecting

*at least **one** from each Section.*

SECTION – A

1. Answer any **two** of the following : $20 \times 2 = 40$

- (a) Explain how control chart helps to control the quality of a manufactured product. Describe the basic of a control chart. Distinguish clearly between chart for variables and chart for attribute. Is it possible to use the latter for former? If so, when and how?

- (b) Define a Poisson process. State the underlying assumptions. Derive the generating function for this process.
- (c) In a game of matching coins with two players suppose A wins one unit of value when there are two heads, wins nothing when there are two tails and loses $\frac{1}{2}$ unit of the value when there is one head and one tail. Determine the pay off matrix, the best strategies for each player and the value of game to A.
2. (a) Distinguish between defect and defective. Give some examples of defect for which c-chart is applicable. How do you calculate control limits for a c-chart ? Discuss the assumptions and approximations involved in calculations. 20
- (b) Describe single sampling plan. Obtain OC and AOQ curve for this plan. Distinguish between Producer's risk and Consumer's risk. 20

3. (a) Define reliability, conditional reliability and hazard function.

Show that if a component has a survival probability over an additional period of length 'y' which is same as its present age, the hazard rate is constant. 20

- (b) Discuss series system and parallel system of reliability. Compute mean time to failure (MTTF) considering exponential distribution. 20

4. (a) Apply the principle of duality to solve the given LPP : 20

$$\text{Max } Z = 3x_1 + 2x_2$$

$$\text{Subject to } x_1 + x_2 \leq 7$$

$$x_1 + x_2 \geq 1$$

$$x_1 + 2x_2 \leq 10$$

$$x_2 \leq 3, x_1, x_2 \geq 0$$

- (b) The probability P_n of failure just before age 'n' is given below. The individual replacement cost Rs. 12.50 and group replacement costs Rs. 3 per item. Find the optimal replacement policy. 20

| n | P_n |
|---|-------|
| 1 | 0.10 |
| 2 | 0.20 |
| 3 | 0.25 |
| 4 | 0.30 |
| 5 | 0.15 |

SECTION - B

5. Answer any **two** of the following : $20 \times 2 = 40$

(a) What do you understand by seasonal variation ? Explain link relative method for computing the indices of seasonal variation.

(b) Explain crude and standardized death rates. In what way standardized death rate is superior to curde death rate ? Give briefly the direct and indirect method of finding standardized death rate.

(c) Describe the scope of Agricultural Statistics. Give brief account of defects in collection of Agricultural Statistics. How these defects can be reduced ?

6. (a) What do you understand by ARIMA model ?
Describe the use of Box-Jenkins method in time series analysis. 20
- (b) What is meant by family budget survey ?
Explain the method of constructing cost of living index numbers. State the uses and limitations of cost of living index number. 20
7. (a) Define a complete life table. Describe various components of a life table. How the expectation of birth can be determined from life table ? 20
- (b) Explain briefly, in what way do total fertility rate (T. F. R.), gross reproduction rate (G. R. R.) and net reproduction rate (N. R. R.) differ from one another as a measure of reproduction. Does T. F. R. strictly confirm our ideas of a measure of reproduction ? 20
8. (a) What do you mean by a T-scale ? Distinguish among σ -Score, Standard Score and T-score. Explain clearly the method of

converting raw test scores into T-scores.
Show that this scaling procedure helps in
process of normalizing a skew distribution.

20

(b) Explain the importance of reliability and
validity in a test of standardization. What is
their relationship to each other ? Describe
the different methods of obtaining the
reliability coefficient and validity coefficient.

20

