

WBCS MADE EASY

MWC(O)-STAT-II/23

2023

STATISTICS

PAPER-II

Time Allowed — 3 Hours

Full Marks — 200

If the questions attempted are in excess of the prescribed number, only the questions attempted first up to the prescribed number shall be valued and the remaining ones ignored.

Answers may be given either in English or in Bengali but all answers must be in one and the same language.

Group-A

1. Answer any ten questions:

10×10=100

- (a) Describe control charts for fraction defectives.
- (b) Distinguish between chance and assignable causes of variation with examples.
- (c) What are the functions of Central Statistical Office (CSO)?
- (d) Define Crude Death Rate (CDR). Discuss its merits and demerits.
- (e) Minimize $z = 20x_1 + 10x_2$ by finding the extreme points of the feasible space. Subject to the restrictions:

$$x_1 + 2x_2 \leq 40$$

$$3x_1 + x_2 \geq 30$$

$$4x_1 + 3x_2 \geq 60$$

$$x_1 \geq 0, x_2 \geq 0.$$

WBCS MADE EASY

- (f) What is exponential smoothing method of forecasting? Why is it called exponentially weighted moving average method?
- (g) What is a life table? What are its uses? Write down the assumptions required for the construction of life tables.
- (h) What do you mean by cost of living index numbers? What are its uses?
- (i) What is homogeneity error in the measurement of price index numbers? How is it controlled?
- (j) Distinguish between acceptance rejection and acceptance rectification type sampling plans.
- (k) What are the different tests for index numbers? Does Laspeyre's price index satisfy all these tests?
- (l) Distinguish between Neonatal and Perinatal mortality rates.
- (m) How National Income is estimated in India through production approach?
- (n) Describe moving average method of trend determination.
- (o) Describe main functions of West Bengal Bureau of Applied Economics and Statistics.

Please Turn Over

For guidance of WBCS Prelims , Main Exam and Interview by WBCS Gr A Officers/ Toppers & Experts, WBCS Prelims and Main Mock Test (Classroom At Kolkata, Siliguri & Other Places & Online), Optional Subjects, Study Materials, Correspondence Course, etc. Call WBCSMadeEasy™ at 8274048710 / 85858543673 / 9674493673 (Sir) or mail us at mailus@wbcsmadeeasy.in. Download WBCS MADE EASY app from play store. Miscellaneous Service, Clerkship & other WBPSC Courses & Mock Test available from WBCS MADE EASY. Visit www.wbcsmadeeasy.in

WBCS MADE EASY

MWC(O)-STAT-II/23

(2)

Group-B

Answer any five questions.

2. (a) Define natural tolerance limits and give its applications.
(b) Construct the range chart for process control. 8+12=20
3. (a) Define GRR and NRR. What happens if $NRR = GRR$?
(b) Define TFR. If in some region number of female births is exactly one third of the total number of births, deduce a relation between GRR and TFR under appropriate conditions. 8+12=20
4. (a) Describe a sequential sampling plan, when observations are classified either defective or non-defective. Derive the boundaries explicitly taking type I and type II error probabilities as α and β , respectively.
(b) Derive an approximate expression of oc-function corresponding to the plan described (a) above. 10+10=20
5. (a) Describe a double sampling plan for attributes. Derive the explicit expression of the oc function for the above plan.
(b) Derive the expression of ASN clearly for the plan given in 5 (a) above under appropriate conditions. 12+8=20
6. (a) Define "reliability". If an item has a random lifetime x , define its reliability function for a mission time of t . If x has the PDF, $f(x) = xe^{-x}$, $x > 0$, find the reliability function for mission time t .
(b) Define "failure rate". Establish a relation between failure rate and reliability function. How do you derive the PDF of a lifetime random variable from given failure rate? 10+10=20
7. (a) Distinguish between "autoregressive" and "moving average" processes. Show that under certain conditions (to be stated by you), an AR (1) process can be expressed as an MA (∞) process.
(b) Derive the correlogram of a stationary AR (2) process. 8+12=20
8. (a) Deduce the following relations:

$$(i) T_x = \frac{1}{2} I_x + \sum_{t=1}^{\infty} I_{x+t}$$

$$(ii) p_x = \frac{e_x}{1 + e_{x+1}}$$

With usual notations.

- (b) Show that ratio of Laspeyre's price and quantity index is proportional to the ratio of Paasche's price and quantity index. 12+8=20

WBCS MADE EASY

WBCS MADE EASY

(3)

MWC(O)-STAT-II/23

9. (a) If $x_1 = 2, x_2 = 3, x_3 = 1$ is a feasible solution to the following LPP,

$$\begin{aligned} \text{Maximize } & Z = x_1 + 2x_2 + 4x_3 \\ \text{Subject to: } & 2x_1 + x_2 + 4x_3 = 11 \\ & 3x_1 + x_2 + 5x_3 = 14, \\ & x_1 \geq 0, x_2 \geq 0, x_3 \geq 0, \end{aligned}$$

find a basic feasible solution.

- (b) A businessman has the option of investing his money in two plans. Plan A guarantees that each rupee invested will earn seventy paise a year, hence while plan B guarantees that each rupee invested will earn two rupees two years hence. In plan B, only investments for periods that are multiples of two years are allowed. How should he invest ten thousand rupees in order to maximize the earnings at the end of 3 years? Formulate this problem as an LP problem.

12+8=20

For guidance of WBCS Prelims , Main Exam and Interview by WBCS Gr A Officers/ Toppers & Experts, WBCS Prelims and Main Mock Test (Classroom At Kolkata, Siliguri & Other Places & Online), Optional Subjects, Study Materials, Correspondence Course, etc. Call WBCSMadeEasy™ at 8274048710 / 85858543673 / 9674493673 (Sir). or mail us at mailus@wbcsmadeeasy.in. Download WBCS MADE EASY app from play store. Miscellaneous Service, Clerkship & other WBPSC Courses & Mock Test available from WBCS MADE EASY. Visit www.wbcsmadeeasy.in