Department of Pre-University Education
Model Paper (March 2023)

[Total No. of Questions: 44] **Subject: STATISTICS** **Class: II P.U.C**
Time: 3 Hrs.15 Min. **Max. Marks: 100**

Note: (1) Graph sheets and statistical tables will be supplied on request.
(2) Scientific calculators may be allowed.
(3) All working steps should be shown clearly.
(4) Section A should be written in the beginning of the answer booklet.

SECTION – A

I. Choose the correct answer. **(5 X 1 = 5)**

1) In a life table the size of the radix is,
   a) 100 b) 1,00,000 c) 1,000 d) 10,000

2) The price of the commodity in the base year and the current year are Rs.5 and Rs.8 respectively. The price relative is,
   a) 160 b) 62.5 c) 100 d) 0.625

3) The area under the normal curve is,
   a) 1 b) 0.5 c) 0 d) -1

4) The error that occurs by rejecting null hypothesis when it is actually true is called,
   a) Size of a test.
   b) Power of a test.
   c) Type I Error.
   d) Type II Error.

5) T.P is said to be balanced if and only if,
   a) $a_i = b_j$ b) $a_i < b_j$ c) $a_i > b_j$ d) $\sum a_i = \sum b_j$

II. Match the following. **(5 X 1 = 5)**

6)

(i) NRR per woman = 0.95	(a) Mean = 1
(ii) $P_{01} = 80$	(b) $H_0 : \mu = 5$
(iii) In a B.D, n = 5 and p = 0.2	(c) Population is decreasing
(iV) $H_1 : \mu < 5$	(d) Shortages are allowed
(V) Model I	(e) 20% of the price of the commodity decreases.

III. Fill in the blanks. **(5 X 1 = 5)**

7) _____ index number does not satisfy unit test.
8) In _____ distribution mean and variance are equal.
9) Chi-square test for goodness of fit is always an _____ tail test.
10) SQC helps in detecting _____ type of variation.
11) A game is said to be fair, if the value of the game is _____.

IV. Answer the following questions. **(5 X 1 = 5)**

12) Define fertility.

13) State the relation between Laspeyre's, Paasche's and Fishers index numbers.

14) What is Historigram?

15) If the parameter of the Student's – t distribution is 8, find the mean.

16) Define solution in an LPP.

SECTION – B

V. Answer any FIVE of the Questions. **(5 X 2 =10)**

17) Mention any two characteristics of Index Numbers.

18) State any two uses of Time Series.

19) Write any two assumptions of Interpolation and Extrapolation.

20) In a Hyper geometric distribution if a = 6, b = 9 and n = 4, find mean.

21) Define level of significance and power of a test.

22) Sizes of two samples are 40 and 50. Population Standard Deviations are 10 and 20. Compute S.E$(\bar{x}_1 - \bar{x}_2)$

23) If $\overline{\overline{X}}$ = 33, $\overline{R}$ = 2 and n = 4, then find the Upper Control Limit of $\overline{X}$ - chart.

24) Write the payoff matrix of Player B,

$$\begin{array}{cc} & \text{Player B} \\ & \begin{array}{cc} B_1 & B_2 \end{array} \\ \text{Player A} \begin{array}{c} A_1 \\ A_2 \\ A_3 \end{array} & \begin{bmatrix} -1 & 2 \\ 1 & -2 \\ 1 & 2 \end{bmatrix} \end{array}$$

SECTION – C

VI. Answer any EIGHT of the following questions. **(8 x 5 = 40)**

25) Calculate Gross Reproduction Rate and comment from the following data.

Age (Years)	15 – 19	20 – 24	25 – 29	30 – 34	35 – 39	40 -44	45 – 49
Female Population	50,000	60,000	60,000	40,000	30,000	25,000	20,000
Female Births	3500	4800	6000	2400	1500	500	200

26) Mention the steps involved in the construction of Index Number.

27) Construct Cost of Living Index by Aggregate Expenditure Method.

Items		A	B	C	D	E	F
2017	Prices (Rs.)	12	14	13	10	11	8
	Expenditure(Rs.)	240	70	39	40	66	72
2018	Prices (Rs.)	17	16	18	25	30	25

28) Compute 3 years moving averages to the following time series data and comment.

Years	2010	2011	2012	2013	2014	2015	2016	2017	2018
Production ('000 tons)	53	65	72	75	70	72	80	78	82

29) Estimate the production for the years 2000 and 2020 with the help of the following table.

Year	1990	1995	2000	2005	2010	2015	2020
Production (in tons)	44	55	?	84	102	121	?

30) The probability of a thermometer manufactured by a firm found to be defective is 0.2. Find the probability that a box containing 50 thermometers contain no defective ones. Among 1000 such boxes, how many contain exactly 2 defective thermometers?

31) A box contains 6 white and 8 red balls. From this box 5 balls are drawn at random. What is the probability that the sample contains 3 red balls?

32) In an election the leaders of a party contend that they would secure more than 40% of votes. A pre-poll survey of 400 voters revealed that the percentage is 45. Does the survey support the leader's claim?

33) Following data gives the readings of sugar level of 5 diabetic patients before and after taking insulin. Test whether insulin control the sugar level at 1% level of significance.

Patients	A	B	C	D	E
Sugar level (Before taking insulin)	250	275	400	350	360
Sugar level (After taking insulin)	210	200	300	270	380

34) 10 samples each of size 5 were inspected and the number of defectives in each of them were as follows. Write down the control limits for suitable control chart.

Sample Number	1	2	3	4	5	6	7	8	9	10
No. of Defectives	0	2	3	1	2	3	0	1	2	1

35) Solve the following L.P.P graphically,

Maximize $Z = 6x + 7y$

Subject to Constraints $3x + 9y \geq 36$

$6x + 4y \leq 24$

and $x, y \geq 0$

36) Find the Transportation cost by least cost entry method. Is solution is non-degenerate?

Destination / Origin	D_1	D_2	D_3	D_4	Supply
O_1	9	3	5	10	7
O_2	7	13	14	6	9
O_3	4	8	12	2	18
Demand	7	8	5	14	34

SECTION- D

VII. Answer any TWO of the following questions. (2 x 10 = 20)

37) For the following data compute standardized death rates and comment.

Age group (in years)	Locality A		Locality B		Standard Population
	Deaths	Population	Deaths	Population	
0-20	72	4000	128	8000	6000
20-40	54	9000	65	13000	12000
40-60	98	7000	140	10000	8000
60 & above	129	3000	160	4000	4000

38) For the following data show that Fishers index satisfies TRT and FRT.

Items	Prices (Rs.)		Quantity (Kgs)	
	2018	2020	2018	2020
A	10	15	4	5
B	20	25	6	8
C	15	20	8	8
D	30	40	5	7

39) Fit an exponential trend of the type $y = a\,b^x$ to the following time series data and estimate the profit for the year 2019.

Years	2014	2015	2016	2017	2018
Profit('000)	12	36	95	150	230

40) (a) 4 unbiased coins are tossed 256 times. Find the theoretical frequencies for the number of heads obtained.

(b) Binomial Distribution is fitted to an observed frequency distribution after estimating 'p' from the observed data. The observed and the expected frequencies are given below.

X	0	1	2	3	4	5
O_i	14	56	110	88	40	12
E_i	10	50	100	100	50	10

Test whether BD is good fit, at 5% L.O.S

SECTION – E

VIII. Answer any TWO of the Questions. (2 X 5 = 10)

41) If X is normally distributed with mean 50 and standard deviation 5 then find,

a) $P(X \leq 43)$ b) $P(54 \leq X \leq 63)$

42) The mean and S.D of heights of a sample of 60 randomly selected Indian's are 176 cm and 3.1 cm respectively. The mean and S.D of heights of another sample of 40 randomly selected Englishmen are 178 cm and 2.5 cm respectively. Can we conclude that Englishmen are taller than Indian's?

(Use $\alpha = 0.05$)

43) From the following data, test the effect of vaccine in controlling the independence of a certain disease at 5 % level of significance.

	Affected	Unaffected
Inoculated	20	25
Non-inoculated	15	40

44) A machine cost Rs. 8,000. The expected maintenance cost and resale values in different years are given below:

Years	1	2	3	4	5	6
Resale value (Rs.)	7,500	7,200	7,000	6,500	5,800	5,000
Maintenance cost (Rs.)	100	120	160	240	300	390

Determine the best age for the replacement of the machine.

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