MODEL PAPER - 2022
II PUC
SUBJECT: STATISTICS (31)

[Total No. of questions: 55]

Time: 3Hrs.15Mins.
Max. Marks: 100

Note: 1. Statistical table and graph sheets will be supplied on request.

      2. Scientific calculators may be used.

      3. All working steps should be clearly shown.

Section – A

I.   Answer **anyten** of the following questions.   **10 × 1 = 10**

1. Define fecundity.
2. Define life table.
3. Name the index number which does not satisfy unit test.
4. Define consumer price index number.
5. What is Historigram?
6. Which variation of the time series is unpredictable?
7. Write the parameter of a Bernoulli distribution.
8. What is the total area under the normal curve?
9. For a chi square (χ^2) variate, if $P\left(0 < \chi^2 < 13.33\right) = 0.5$, find median.
10. What is meant by estimation?
11. Define null hypothesis.
12. Define confidence interval.
13. What is a control chart?
14. In L.P.P define solution.
15. Define 'strategy' in a game.

Section – B

II.   Answer **anyten** of the following questions.   **10 × 2 = 20**

16. Mention two uses of vital statistics.
17. In a life table, if $l_1 = 95,400$ and $l_2 = 93,492$ then, find d_1.
18. Mention two characteristics of index numbers.
19. If $\Sigma p_1 q = 450$ and $\Sigma p_0 q = 400$, find Kelly's price index number.
20. Find consumer price index number from the following data.

Group	A	B	C	D
Group Index	100	120	130	110
Weight	2	3	1	4

21. Mention two uses of time series.
22. Diagrammatically represent 'Business Cycle' with stages.
23. Write down the conditions for applying of Binomial expansion method of interpolation and extrapolation.
24. Find P(X = 0) in a Poisson distribution with mean 5.
25. If n = 4 for student's t-distribution, find S.D.
26. If P = 0.1 and n = 100, then find S.E(p).
27. Define type I and type II errors.

28. If $\bar{x} = 40$, $\bar{R} = 2.5$ and $A_2 = 0.577$, find lower control limit of $\bar{x}$- chart.
29. What are degenerate and non-degenerate solutions in T.P?
30. Mention two needs for replacement of equipments.

Section – C

III. Answer **any eight** of the following questions.   **8 × 5 = 40**

31. From the following data, find CBR and GFR.

Age [in years]	Male Population	Female Population	Number of live births
0 - 14	46000	43000	-
15 - 24	34000	32000	6846
25 - 39	39000	38000	3893
40 - 49	30000	28000	674
50 - 79	27000	26000	-
80 & above	15000	12000	-

32. For the following data, calculate gross reproduction rate.

Age group [in years]	15 - 19	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49
Female population	14,000	15,000	14,000	13,000	12,000	11,000	10,000
Female births	630	870	980	650	600	220	30

33. What are the steps involved in the construction of index number? Explain any two of them.

34. The following are the prices (in Rs.) of items in 2010 and 2015. Find simple geometric mean price index number.

Item		A	B	C	D	E	F
Price (Rs.)	2010	50	60	20	50	80	125
	2015	55	75	30	75	70	130

35. Obtain trend values by 3 yearly moving averages for the following data.

Year	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Sales ('000)	86	63	45	58	43	57	98	120	100	150

36. For the following time series fit a linear trend by the method of least squares.

Year	2002	2004	2006	2008	2010	2012
Profit (in crores)	10	20	32	36	52	60

37. Interpolate and extrapolate the production for the years 2000 and 2010 with the help of the following table.

Year	1980	1985	1990	1995	2000	2005	2010
Production (tons)	5	12	19	26	-	40	-

38. In a city 40% of the people are vegetarians. In a random sample of 6 persons find the probability that i) 3 are vegetarians, ii) at least one is vegetarian.

39. A pond has 10 fishes among which 4 are marked ones (marked fishes are under scientific observation). 4 fishes are caught from the pond. Find the probability that two of them are marked ones. Also find the mean of marked ones.

40. It is required to test whether those who practice Yoga have average blood sugar less than 120 mg/dl. A sample consisting of 36 persons who practice Yoga is observed. If their mean blood sugar is 118.5 mg/dl and variance is 9 mg2/dl. At 1% level of significance what would you conclude?

41. For the following data examine whether the means differ significantly? Use α=0.05.

Sample	I	II
Size	12	7
Mean	57.2	52.3
S.D.	3.41	3.62

42. From the following data, test whether 'education' and 'employment' are independent at 1% level of significance.

Education	Employment	
	Employed	Unemployed
Educated	20	25
Uneducated	15	40

43. In a floor mat manufacturing company, the average number of defects per square meter is known to be 4. Determine the control limits for the number of defects.

44. Solve the following L.P.P graphically:
Max. Z = 10x + 15y
s.t. x + y ≤ 10
    3x + 2y ≥ 15
and x, y ≥ 0
OR
(For visually challenged students only)
Explain graphical method of solving L.P.P.

45. Solve the following game using the principle of dominance.

$$\begin{array}{c} \text{Player B} \\ \begin{array}{cccc} B_1 & B_2 & B_3 & B_4 \end{array} \\ \text{Player A} \begin{array}{c} A_1 \\ A_2 \\ A_3 \end{array} \begin{pmatrix} 1 & 2 & 0 & 3 \\ 4 & 6 & 3 & 5 \\ 3 & -1 & -2 & 0 \end{pmatrix} \end{array}$$

Section – D

IV. Answer **any two** of the following questions. **2 × 10 = 20**

46. From the following data, compute standardized death rates for Town A and Town B. Comment on the results.

Age group [in years]	Town - A		Town - B		Standard Population
	Population	Deaths	Population	Deaths	
0 – 20	4,000	36	3,000	30	2,000
20 – 40	12,000	48	20,000	100	3,000
40 – 60	6,000	60	4,000	48	6,000
60 & above	8,000	152	3,000	60	4,000

47. Find Laspeyre's, Paasche's and Dorbish-Bowley's price index numbers for the following data.

Item	2004		2008	
	Price (Rs.)	Quantity	Price (Rs.)	Quantity
A	10	5	15	4
B	15	8	20	7
C	6	3	10	5
D	3	4	4	5

48. For the following data verify whether Fisher's index number satisfies TRT and FRT.

Item	Price (Rs.)		Quantity	
	Base year	Current year	Base year	Current year
A	4	6	4	6
B	6	10	4	8
C	8	11	5	3

49. For the following time series fit a second degree trend of the type $Y = a + bx + cx^2$ by the method of least squares. Estimate the profit for the year 2010.

Year	2005	2006	2007	2008	2009
Profit (in lakhs)	10	8	12	18	26

50. Following is the data regarding number of mistakes per page found in a book. Fit a Poisson distribution. Test at 5% L.O.S. that it is a good fit.

No. of mistakes per page	0	1	2	3	4	5 and more
No. of pages	31	34	21	12	2	0

Section – E

V. Answer **any two** of the following questions. **2 × 5 = 10**

51.   Marks scored by the students of a class follows normal distribution with mean 80 and S.D. 5. Find the probability that a student selected at random from the class scored i) more than 70 marks   ii) between 75 and 90 marks.

52.   In a random sample of 120 people from a city in the year 2011 revealed that 96 were cricket match viewers. In another random sample of 100 people from same city in the year 2013 revealed that 90 were cricket match viewers. Examine whether there is a significant increase in the proportion of cricket match viewers. Use 1% level of significance.

53.   The following data represents the blood pressure of 5 persons before and after performing dhyana:

Person	A	B	C	D	E
B.P. Before Dhyana	90	90	100	88	99
B.P. After Dhyana	88	90	95	90	96

Can we conclude at 5% level of significance that Dhyana reduces blood pressure?

54.   The purchase price of a machine is Rs 8,000. Its maintenance costs and resale values are given below:

Year	1	2	3	4	5
Maintenance cost (Rs.)	500	600	800	1,100	1,500
Resale value (Rs.)	4,500	3,500	2,500	1,500	500

What would be the optimum replacement period of machine? What would be the average annual cost?

55.   There is a demand for 10,000 items per year. The replenishment cost is Rs.200 and the maintenance cost is Rs.9 per item per year. Replenishment is instantaneous and shortages are not allowed. Find economic order quantity and minimum average inventory cost.

*****