

2025 -26 II PUC PREPARATORY EXAMINATION

SUBJECT: 31 - Statistics

MAXIMUM MARKS: 80

TIME: 03 HOURS

NUMBER OF QUESTIONS: 33

Instructions:

1. Statistical tables and graph sheets will be supplied on request.
2. Scientific calculators are allowed.
3. All working steps should be clearly shown.
4. For 'Section - A' questions, only the first written answers will be considered for evaluation.
5. For the question having graph, alternative question is given at the end of the question paper in a separate section for visually challenged students.

SECTION - A**I. Choose the most appropriate answer from the choices given:**

(5 X 1 = 5)

- 1) Average number of infants deaths per thousand live births in a year is called
 - a) Crude death rate
 - b) Infant mortality rate
 - c) Neonatal mortality rate
 - d) Maternal mortality rate
- 2) Sudden unexpected variation in a time series is called
 - a) Secular trend
 - b) Seasonal variation
 - c) Cyclical variation
 - d) Irregular variation
- 3) If the binomial distribution is symmetrical with $n = 4$ then its mode is
 - a) 4
 - b) 3
 - c) 2
 - d) 1
- 4) There are 4 possible decisions under the testing of null hypothesis
 - i) Accept H_0 , when it is true
 - ii) Reject H_0 , when it is true
 - iii) Accept H_0 , when it is not true
 - iv) Reject H_0 , when it is not true
 - a) i and ii
 - b) iii and iv
 - c) i and iii
 - d) i and iv
- 5) A game is said to be fair, if value of the game is
 - a) $v = 0$
 - b) $v \neq 0$
 - c) $v = 1$
 - d) $v = 2$

II. Fill in the blanks by choosing the appropriate answers given in the brackets:

(5 X 1 = 5)

(Defect, Positively, Decision, Approximate, Defective, Estimation)

- 6) Index numbers are based on sample data, they are only _____ indicators.
- 7) Poisson distribution is _____ skewed.
- 8) Method of obtaining most likely value of the population parameter using statistic is called _____.
- 9) A _____ is a quality characteristic which does not conform to specifications.
- 10) In LPP the variables x_1, x_2, \dots, x_n whose values are to be determined are called as _____ variables.

III. Match the following:

11)

A

- a. Child bearing age of woman
- b. Cost of living index number
- c. $Z_1^2 + Z_2^2$
- d. $H_1 : \mu_1 < \mu_2$
- e. Physical stock of goods

B

- i. $\chi^2(2)$
- ii. $H_0 : \mu_1 = \mu_2$
- iii. 15 - 49 years
- iv. Inventory
- v. $P - S_p$
- vi. Retail price of the commodity

(5 X 1 = 5)

IV. Answer the following questions:

- 12) Define cohort.
- 13) Name the index number which does not satisfy unit test.
- 14) In which distribution mean and variance are same?
- 15) Define standard error.
- 16) Define basic feasible solution of a transportation problem.

SECTION – B

V. Answer any FIVE of the following questions:

(5 X 2 = 10)

- 17) Diagrammatically represent 'Business cycle' with stages.
- 18) Write down the conditions for applying binomial expansion method of interpolation and extrapolation.
- 19) Find $P(X = 0)$ for a Poisson distribution with mean 5.
- 20) For a chi-square variate with 10 d.f. $P(0 < \chi^2 < 9.33) = 0.5$. Find median and mode.
- 21) If $P = 0.3$ and $n = 81$, then find $SE(p)$.
- 22) Write two conditions for applying χ^2 test for independence of attributes.
- 23) If $\bar{X} = 40$, $\bar{R} = 2.5$ and $A_2 = 0.577$, find lower control limit of \bar{X} chart.
- 24) For an equipment the fourth-year depreciation cost is Rs. 6,000 and the cumulative maintenance cost is Rs. 6,200. Find the average annual cost.

SECTION – C

VI. Answer any FOUR of the following questions:

(4 X 5 = 20)

25) Calculate simple geometric mean index number from the following data.

Items		A	B	C	D	E
Price (Rs.)	2018	10	15	8	25	20
	2022	12	18	10	20	20

26) Using Newton's difference method Interpolate the value of Y when X = 550.

X	500	600	700	800
Y	50	150	300	500

- 27) There are 50 smart watches in a box 4 of them are defective. What is the probability of getting at most 2 defective smart watches in a selection of 5 watches?
- 28) In hyper-geometric distribution, if $a = 5$, $b = 3$ and $n = 4$. Find mean and variance of the distribution.
- 29) A manufacturer is making axle with diameters 0.7". A random sample of 10 axles shows a mean diameter of 0.742" with S.D of 0.04". Test whether manufacturer is meeting the specification. Use $\alpha = 5\%$.
- 30) Obtain initial basic feasible solution for the following transportation problem by N.W.C.R. Find the transportation cost.

		To			Availability
		D ₁	D ₂	D ₃	
From	O ₁	5	7	6	15
	O ₂	2	4	8	25
	O ₃	4	3	2	10
	O ₄	1	7	5	20
Requirement		30	15	25	

31) Given demand = 4000 items/year, Holding cost = Rs. 3/item/year, setup cost = Rs. 40/cycle. Calculate, i) EOQ ii) Minimum average inventory cost.

VII. Answer any TWO of the following questions:

32) If X is a normal variate with mean μ and S.D σ , find the probability that X takes a value in the neighbourhood of μ . (2 X 5 = 10)

33) From the following data, test whether the Poisson distribution is a good fit. The values are tabulated after estimating the parameter. Use $\alpha = 0.01$.

O_i	211	90	19	4	1
E_i	210	92	20	3	0

34) 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.

35) Solve the following linear programming problem graphically:
Maximize $Z = 20x + 12y$

Subject to constraints: $3x + y \leq 30$

$$x + y \leq 20$$

$$\text{and } x, y \geq 0$$

SECTION - D

VIII. Answer any TWO of the following questions:

(2 X 10 = 20)

36) a) From the following data compute total fertility rate. (5)

Age (in years)	15 - 19	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49
Female population	8,000	10,000	14,000	20,000	15,000	5,000	4,000
Live births	320	550	1260	2000	1035	150	44

b) Calculate standardised death rate from the following data. (5)

Age (in years)	Population	Deaths	Standard population
0 - 20	4,000	36	2,000
20 - 40	12,000	48	3,000
40 - 60	6,000	60	6,000
60 and above	8,000	152	4,000

37) Calculate Laspeyre's, Paasche's and Dorbish-Bowley's price index numbers from the following data.

Items	2008		2010	
	Price (in Rs)	Quantity	Price (in Rs)	Quantity
A	10	5	12	4
B	15	8	18	7
C	6	3	4	5
D	3	4	3	5

38) 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 value for the year 2019.

Year	2005	2007	2009	2011	2013	2015	2017
Value	25	20	18	24	30	38	45

SECTION - E

(For Visually challenged students only)

35) Explain graphical method of solving L.P.P.