

(English Version)

Instructions :

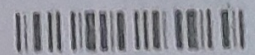
1. Statistical table and Graph sheets will be supplied on request.
2. Scientific calculators are allowed.
3. All working steps should be clearly shown.
4. For Section-A, only the first written answers will be considered for evaluation.
5. For questions having diagram, graph and map, alternative questions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

SECTION – A

Choose the correct answer from the choices given :

(5 × 1 = 5)

- 1) Life expectancy of a newborn baby
 - a) Mortality
 - b) Longevity
 - c) Fertility
 - d) Fecundity
- 2) The weights used in the construction of Marshall-Edgeworth's price index number
 - a) q_0
 - b) q_1
 - c) $\left(\frac{q_0 + q_1}{2}\right)$
 - d) $(q_0 + q_1)$
- 3) The variance of a χ^2 - distribution with 12 degrees of freedom is 24. Then its mean is
 - a) 72
 - b) 2
 - c) 0.5
 - d) 12



4) Type I error is

- a) Rejecting H_0 when it is true
- b) Accepting H_0 when it is true
- c) Rejecting H_0 when it is not true
- d) Accepting H_0 when it is not true

5) The game is said to be fair, if the value of the game is

- a) $V > 0$
- b) $V = 0$
- c) $V < 0$
- d) $V \neq 0$

Fill in the blanks by choosing the appropriate answer from those given in the brackets : (5 × 1 = 5)

$\left(\frac{1}{2}, d_2\sigma', \text{Geometric mean}, \sqrt{\frac{PQ}{n}}, \text{first}, \bar{R} \right)$

- 6) The best average used in the construction of index number _____.
- 7) Binomial distribution is positively skewed when $p < \underline{\hspace{2cm}}$
- 8) Standard error of the sample proportion is _____
- 9) For R -chart if σ' is known, then _____ is the central line.
- 10) The feasible solution to the L.P.P exists in _____ quadrant.

III. Match the following.

A

B

11) Deaths of new born babies within 28 days

a) Lepto Kurtic ($\beta_2 > 3$)

12) Index number which doesn't satisfy unit test

b) $1 - \beta$

13) Student's t-distribution curve

c) C_2

14) Power of a test

d) Neonatal deaths

15) Shortage cost

e) Simple aggregative price index number

f) P (Type I error)

IV. Answer the following questions :

(5 × 1 = 5)

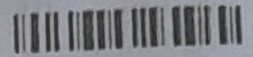
16) Write one use of vital statistics.

17) Define secular trend.

18) A normal variate has mean 150 and variance 25. Find the standard deviation.

19) Define rejection region.

20) When is the solution to the transportation problem said to be non-degenerate?



SECTION – B

V. Answer **any five** of the following questions :

(5 × 2 = 10)

- 21) Define irregular variation and give an example.
- 22) Write two conditions for applying binomial expansion method of interpolation and extrapolation.
- 23) Write down the Bernoulli distribution probability mass function with the parameter $p = \frac{2}{5}$.
- 24) If z_1 and z_2 are two independent S.N.Vs then name the distribution of $(z_1^2 + z_2^2)$ and write its mean.
- 25) Define parameter and statistic.
- 26) Given : $n_1 = 100$, $n_2 = 60$, $P_1 = 0.4$ and $P_2 = 0.8$. Find S.E. $(p_1 - p_2)$.
- 27) In statistical quality control, what are defect and defectives?
- 28) Given : $R = 5000$ items/year, $C_3 = ₹ 50/\text{cycle}$, $C_1 = ₹ 2/\text{item/year}$. Calculate minimum average inventory cost.

SECTION – C

VI. Answer **any four** of the following questions :

(4 × 5 = 20)

29) Construct a suitable index number for the following data and comment.

Item	Price (in ₹)		Quantity 2023
	2018	2023	
Rice	20	40	10
Wheat	25	32	3
Ragi	18	30	5
Oil	80	100	3

30) Interpolate the value of Y when $X = 25$, using Newton's forward difference method for the following data.

X	10	20	30	40
Y	13	15	19	25

31) In a class 60% of the students are boys. In a random sample of 5 students, find the probability that (a) 2 are boys (b) atleast one is a boy.

32) A box contains 5 blue and 7 pink marbles. 5 marbles are drawn at random. What is the probability that the sample contains 2 pink marbles? Also find the mean number of pink marbles.

33) A sample of 100 students is chosen from a large group of students. The average height of these students is 162 cm. and standard deviation is 8 cm. At $\alpha = 5\%$, can we reasonably assume that the average height of large group of students is 160 cm?

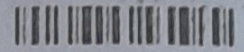
34) Five students were given an intensive coaching and 2 tests were conducted before and after coaching, the change in their marks are as follows :

2, 0, 5, -2, 3

Do the scores after coaching show an improvement? Use $\alpha = 5\%$.

35) For the following transportation problem, find the initial basic feasible solution by North-West corner rule. Compute the total transportation cost.

		Dealers			Availability
		D_1	D_2	D_3	
Factory	O_1	8	4	12	50
	O_2	10	5	6	20
	O_3	7	15	3	10
Demand		40	20	20	



- 36) The price of a machine is ₹ 3,000. Its maintenance cost and resale value at different ages are given below :-

Year	1	2	3	4	5	6
Maintenance cost (₹)	1000	1100	1150	1300	1500	1900
Resale value (₹)	1750	1250	850	600	500	450

What is the annual average cost? When the machine be replaced?

VII. Answer **any two** of the following questions.

(2 × 5 = 10)

- 37) The daily wages of workers of a factory are normally distributed with mean ₹ 500 and standard deviation ₹ 40. Find the probability of worker whose daily wage will be (a) more than ₹ 530 (b) between ₹ 380 and ₹ 460.
- 38) Following expected frequencies are obtained after fitting binomial distribution by estimating the parameter.

O_i	29	37	45	62	50	27
E_i	7	35	75	81	43	9

Test whether binomial distribution is a good fit at $\alpha = 1\%$.

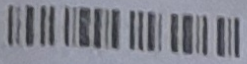
- 39) In a fish net manufacturing process, the average number of defects per square meter is known to be 3. Determine the control limits for the number of defects.
- 40) Solve the following linear programming problem graphically.

$$\text{Maximise } Z = 5x + 10y$$

$$\text{Subject to constraints : } 5x + 4y \leq 40$$

$$3x + 4y \geq 24$$

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



SECTION – D

VIII. Answer **any two** of the following questions :

(2 × 10 = 20)

41) Calculate gross reproduction rate and net reproduction rate for the following data and comment on the result.

Age group (in years)	Female population	Female births	Survival ratio
15-19	50,000	1,000	0.91
20-24	60,000	7,000	0.90
25-29	45,000	8,000	0.89
30-34	40,000	5,000	0.88
35-39	30,000	3,000	0.87
40-44	25,000	1,000	0.86
45-49	20,000	100	0.85

42) a) Compute the cost of living index number for the following data. (5)

Group	Weight	Price (in ₹)	
		Base Year	Current Year
Food	5	1600	2400
House rent	10	4000	5000
Clothing	3	800	1000
Fuel and lighting	4	100	400
Others	5	1600	2000



- b) Compute value index number from the following data. Comment on the result. (5)

Item	2018		2020	
	Price (₹)	Quantity (kg)	Price (₹)	Quantity (kg)
A	50	8	60	10
B	80	4	100	5
C	70	6	60	6
D	30	5	50	7

- 43) Fit a second degree parabola of the type $y = a + bx + cx^2$ by the method of least squares to the following time series. Estimate the value for 2020.

Year	2010	2012	2014	2016	2018
Value	14	12	11	10	13

SECTION – E

(For Visually Challenged Students only)

- 40) Write the procedure of solving linear programming problem graphically.
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