

**SECTION-A****I. Answer any TEN of the following questions.****10x1=10**

1. What is demography?
2. Define price relative.
3. State the relationship between Laspeyer's, Paasche's and Fisher's price index.
4. Mention a factor causing oscillatory variation.
5. Consider the following p.d.f of a normal variate X,

$$f(x) = \frac{1}{5\sqrt{2\pi}} e^{-\frac{1}{2}\left(\frac{x-10}{5}\right)^2}; -\infty < x < \infty. \text{ write the variance.}$$

6. Find the variance of t-distribution when $n \leq 2$.
7. Define parameter.
8. For the χ^2 test, what is the condition for expected cell frequency?
9. If in a large sample test the test statistic value is 2. What is your conclusion at 1% level of significance for a two tailed test?
10. Give an advantage of SQC.
11. When do you suggest for replacement of equipment which deteriorates with age?
12. What do you mean by inventory?

SECTION-B**II. Answer any TEN of the following questions.****10x2=20**

13. Mention any 2 uses of vital statistics.
14. Why index numbers are known as economics barometers?
15. Given $\sum p_1q = 3600$ and $\sum p_0q = 2850$. Calculate a suitable number.
16. Diagrammatically represent 'Business cycle' with stages.
17. Write the binomial expansion for (i) 5 known terms (ii) 6 known terms.
18. If $X \sim P.D(5)$ then find $P(X = 0)$.
19. If variance of a χ^2 variate is 18, then find its mean.
20. A lot contains 6% defective items. 45 items are chosen from it. Find S.E (p).
21. Define estimate and estimator.
22. Find the average quality level of R-chart when $\sigma^1 = 4$ and $n = 5$.
23. Define (i) Pure strategy (ii) Mixed strategy.
24. If $R = 100$ units/month, $C_3 = ₹250/\text{cycle}$ and $C_1 = ₹20/\text{unit/month}$. Find EOQ.

SECTION-C**III. Answer any Eight of the following questions:****8x5=40**

25. Compute STDR for town X and Y and state which town is healthier.

Age (in years)	Town X		TownY		Standard Population
	Population	Deaths per 1000	Population	Deaths per 1000	
0-9	13500	10	8700	12	35000
10-29	8900	18	5500	20	15000
30-59	5000	20	3700	24	20000
60 and above	12000	15	6900	18	30000

26. What are the steps involved in the construction of index numbers? Explain any three.

27. Calculate weighted arithmetic mean price index number for the following data.

Items	Expenses	2013	2015
		Price	Price
A	34.74	5.79	6
B	30.00	5.00	8
C	6.00	6.00	9
D	48.00	8.00	10
E	8.00	2.00	1.50
F	20.00	20.00	15

28. Calculate 5 yearly moving averages from the following data regarding the number of industries in India.

Years	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
No. of Industries	25	28	30	34	22	14	14	12	11	15

29. Interpolate and extrapolate the production for the years 2010 and 2016.

Years	2004	2006	2008	2010	2012	2014
Production (in tons)	100	120	150	-	525	780

30. On an average, one house out of 500 houses in a locality has a fire during a year. If there a 1000 houses in that locality, find the probability that (i) atmost 3 houses (ii) atleast house will have five during the year.

31. State five properties of normal distribution.

32. The number of defective articles produced by 9 machines in 2 different batches are given below.

	Batch I	Batch II
No. of defectives	3	2
No. of articles	100	500

Has the proportion of defective articles increased in the second batch? (use $\alpha=1\%$).

33. A farmer surveyed 4 plots of land of 9 acre each and found the following productions of rice in quintals: X:1269, 1271, 1263, 1265. He had decided that his production should have a S.D. of 2 quintals. Test at 5% level of significance whether his data is consistent with his assumption.

34. From the past record it is known that the number of defectives in 50 samples of size 500 is 60. Calculate control limits for d-chart.

35. A firm thinks of replacing a machine that costs ₹1,22,000. The scrap value is only ₹2000. The annual operating cost is ₹2200 for the first year, increases by ₹3000 in the next two year and ₹4000 in the subsequent years. When should the machine be replaced?

36. For the following T.P find an initial B.F.S by NWCR method. Is the solution degenerate.

Origin	Destination	D ₁	D ₂	D ₃	D ₄	Availability
	O ₁	15	14	18	15	300
	O ₂	17	19	15	10	250
	O ₃	21	25	14	11	150
Requirement		100	200	150	250	700

SECTION-D

IV. Answer any TWO of the following questions.

2x10=20

37. Calculate crude birth rate, general fertility rate and age-specific fertility rates for the age group. (10-19), (20-29) (10-24) (25-59) and (30-59) from the following data.

Age (in years)	Male population	Female population	No. of live births
0-9	6400	5197	0
10-19	5430	6193	196
20-24	6300	7888	480
25-29	2300	3444	780
30-39	4700	3800	211
40-59	5600	4400	45
60 and above	2800	1119	0

38. (a) For the data given below check whether Marshall-Edgeworth’s index number satisfies TRT.

Items	2010		2015	
	Price	Value	Price	Value
A	5	50	8	56
B	4	32	5	40
C	1	10	2	24
D	2	18	4	40

- b) Calculate appropriate index number for the years 2012 and 2014 with regard to base 2010.

Items	Quantity			Price
	2010	2012	2014	2010
A	8	50	49	10
B	10	20	25	12
C	15	12	10	18
D	18	2	5	20
E	17	5	8	22

39. The prices of a commodity are given below. Fit a second degree equation to the data and estimate the price for the year 2011.

Years	2005	2006	2007	2008	2009	2010
Prices	150	135	128	140	181	192

40. The table below shows the number of days in a 50 days period during which bike accidents occurred in a city. Fit a poisson distribution and test the goodness of fit.

No. of accidents	0	1	2	3	4
No. of days	21	18	7	3	1

SECTION-E

V. Answer any TWO of the following questions.

2x5=10

41. A supermarket installs neon lamps in its premises. If the lamps have an average life of 1000 burning hours with a variance of 14400 hour²;
- Find the probability of lamps whose average life will be between 925 hours and 1165 hours.
 - Show that only 10% of the lamps fail in less than 847 burning hours.
42. The mean breaking strength of cables supplied by a manufacturer is 1500 and variance 8100. By new techniques it is claimed that the breaking strength of the cables has increased. In order to test this a sample of 64 cables are tested. It is found that the mean breaking strength is 1540. Can we support the claim at 0.01 level of significance?

43. The following are the marks of 6 students in the preparatory and in P. U. Board examinations.

Preparatory Marks	P.U. Board Marks
74	86
83	84
56	64
79	72
30	35
46	53

Can we conclude that, on an average, students have performed better in Board examination than in the preparatory exam.

44. Solve the following game by maximin-minimax principle. Is the game fair?

Player-B

		B_1	B_2	B_3	B_4
Player-A	A_1	5	4	-7	2
	A_2	6	6	-4	-2
	A_3	-8	8	-8	-2
