Note: 1. Graph sheets and statistical tables will be supplied on request.
2. Scientific calculators are allowed.
3. All working steps should be clearly shown.

Section– A

I.   Answer any TEN of the following: **10× 1 = 10**
1. Define vital statistics.
2. Which index number shows upward bias?
3. Define CPI?
4. Which variation in time series is predictable?
5. For a Chi-square variate with 10 df, find the variance.
6. If Z is a SNV and $P(Z>K) = 0.05$, find the value of K.
7. Define Type I error?
8. What is an estimator?
9. Write the df while testing independence of attributes in a 2x2 Contingency table.
10. Define S. Q.C.
11. When a Transportation problem is balanced?
12. Define two person zero sum game.

Section– B

II.   Answer any TEN of the following: **10 × 2 = 20**
13. In a life table, if $l_0 = 100000$ and $T_0 = 6500000$ years then, find longevity.
14. Mention the limitations of Index Number.
15. Define Unit Test.
16. Write any two demerits of least square method.
17. Expand $(y-1)^4$.
18. If $p = 1/4$, $n=5$ write the mean and variance.
19. Write the value of β_1 and β_2 in a t- distribution.
20. Given $\bar{X} = 22$ gm, $\mu_0=20$gm, $\sigma = 10$gm and n-64 calculate the test statistic Z.
21. Define null and Alternative hypothesis.
22. What is meant by single and double sampling plan?
23. What do you mean by replacement problems?
24. Define setup cost and Holding cost.

Section – C

III.   Answer any EIGHT of the following: **8 × 5 = 40**
25. Calculate GRR from the following data and comment on population status.

Age group (in years)	Female Population	Female births
15-19	8600	80
20-24	9400	230
25-29	9000	480
30-34	8500	300
35-39	7800	210
40-44	7200	160
45-49	6800	60

26. Compute suitable index number from the following.

Commodity	Unit	Quantity consumed		Price in 1990
		2000	2005	
A	Kgs.	180	200	10
B	Kgs.	60	80	12

| C | Meter | 15 | 25 | 18 |
| D | packets | 20 | 40 | 10 |

27. Compute the cost of living index number for the data given below and comment.

Groups	Price (Rs.)		Weights
	Base year	Current year	
Food	1200	1600	20
Clothing	400	600	10
Fuel & Light	800	1000	15
Entertainment	200	400	8
Medicine and Education	300	600	12
Others	1450	1800	25

28. For the given time series, fit a straight line trend of the type y = a+bx by the method of least squares.

Year	1994	1995	1996	1997	1998
Production (in tons)	35	55	79	80	40

29. Using Newton's forward interpolation method find y when x = 15.

x	12	14	16	18	20
y	21	69	125	189	261

30. On an average the number of defective items in a box is 2. If there are 100 such boxes, in how many of them would you expect two defectives?

31. Mention five features of normal curve.

32. The average monthly income of 50 families is found to be Rs.44,950, can we conclude that the average monthly income of the population of families is Rs.45,000 with a S.D. of Rs.50? Test at 5% L.O.S.

33. A die is rolled 90 times and the following distribution is obtained.

Face value	1	2	3	4	5	6
No. of throws	10	18	11	13	20	18

Test at 5% LOS whether the die is fair.

34. Draw R-chart for the following data and give your conclusion R_i ; 6, 5, 8, 4, 1, 2 and n=5

35. A manufacturer produces 2 products A and B which needs two machines P and Q. Product A requires 6 hrs on machine P and 2 hrs on machine Q. Product B requires 4 hours on machine P and 4 hours an machine Q. There are 100 hours of time available on machine P and 80 hours an machine Q. Profit earned by the manufacturer on selling one unit of A is Rs.10 and on selling one unit of B is Rs.15, Formulate L.P.P.

36. A firm has an annual demand of 3000 units of row materials. The setup cost is Rs.25 per order and holding cost is Rs.2 per unit / year. Determine (i) optimal order quantity (ii) number of order per year (iii) Annual average inventory cost.

Section – D

IV.   **Answer any TWO of the following:**   **2× 10 = 20**

37. From the following data, calculate Total Fertility Rates and compare the fertility of the two cities.

Age	Female Population		No. of live births	
	City A (000's)	City B (000's)	City A	City B
15-19	14	47	1204	1222
20-24	15	50	2295	7400
25-29	14	46	2590	9660
30-34	12	44	1236	5544
35-39	13	40	936	1360
40-44	12	39	288	507
45-49	11	30	33	60

38. Verify whether Marshall – Edgeworth's Index number satisfies Time Reversal Test and Factor Reversal Test using the following dates.

Items	Base year		Current year	
	Price year	Quantity	Price	Quantity
A	40	2	50	3

B	20	3	30	3
C	30	6	30	8
D	80	5	100	6

39. Fit a parabolic trend to the following time series and estimate the profit for the year 2010.

Year	1998	1999	2000	2001	2002	2003	2004
Profit	50	60	55	61	72	73	75

40. Following is the data regarding number of mistake per page found in a book containing 1090 pages. Fit a Poisson distribution. Test at 5% L.O.S. that it is a good fit.

No. of mistake per page	0	1	2	3	4	5	6
No. of pages	351	376	225	89	33	13	3

Section – E

V. **Answer any TWO of the following:**   **2× 5 = 10**

41. A students preparing for an examination studies only 20 out of 25 sections prescribed. If the teacher selects 10 sections at random, what-is the probability that the students will have studied 9 of these sections?

42. A machine produced 5 defective articles among 80, after some repair the machine produced defective articles among 60. Test whether the preparation of defective articles have reduced after repair at 5% L.O.S.

43. Following is the data regarding five students administered for an I.Q. test before and after treatment of yoga training to increase I.Q.

IQ before training	118	120	116	115	125
IQ after training	125	118	125	120	130

Is yoga training is effective? (at $\alpha = 5\%$).

44. A machine costs Rs.35000 and the operating cost is estimated to be Rs.500 for the first year and increase by Rs.3000 every year for next 5 years. Determine the optimum period for replacement of the machine, assuming that the machine has no resale value.

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