

13223

8. (a) Prepare Price index numbers for 2005 with 2002 as base year from the following data by using : (i) Laspeyre's, (ii) Paasche's and (iii) Fisher's formula 6.5

Year	Article I		Article II		Article III		Article IV	
	Price	Qty.	Price	Qty.	Price	Qty.	Price	Qty.
2002	5.00	5	7.75	6	9.63	4	12.50	9
2005	6.50	7	8.80	10	7.75	6	12.75	9

- (b) What is meant by splicing of index numbers? Explain with a suitable example. 6.5

This question paper contains 6 printed pages]

Your Roll No. :

Sl. No. of Q. Paper : 13223 I

Unique Paper Code : 32371403

Name of the Paper : Statistical Quality Control

Name of the Course : B.Sc. (H) Statistics

Semester : IV

Time : 3 Hours Maximum Marks : 75

Instructions for Candidates :

- Write your Roll No. on the top immediately on receipt of this question paper.
 - Attempt any **six** questions in **all**.
 - Question **1** is compulsory.
 - Select **four** questions from **Section-A** and one from **Section-B**.
 - Use of simple scientific calculator (non-programmable) is allowed.
- What do you mean by quality? Discuss briefly various dimensions of quality. 5
 - What do you understand by Statistical Quality Control? Distinguish between Process and Product control. 5

Section - A

2. (a) Discuss and drive the construction of $\bar{X}$ and s charts for controlling process average and process variability, when population parameters are unknown. 6.5
 (b) In order to determine whether or not a production of bronze casting is in control, 20 sub-groups of size six taken. The quality characteristics of interest is the weight of the castings and it is found that $\bar{X} = 3.126$ gm and $R = 0.009$ gm. Assuming that the process is in control, find upper and lower limits for the sub groups means and Range. 6.5
3. (a) Drive control charts for controlling the proportion defectives when sample size is not fixed. 6.5
 (b) When all sample points lie within 3σ limits. Discuss the interpretation of control charts for variables, and describe the major 4 Western Electric rules for different non-random pattern. 6.5
4. (a) Discuss the average quality protection approach to decide the sample size and acceptance number in respect of single sampling plan. 6.5

- (b) What are modified control limits? How they are derived. What is the need of constructing modified control limits? 6.5
5. (a) What is an OC curve? Draw its important points on the plot. Obtain its expression in a single sampling plan. 6.5
 (b) Define AOQ and AOQL. For a single sampling plan obtain an expression for AOQL. 6.5
6. Distinguish between:
 - (a) ASN and ATI for single sampling plan 4
 - (b) Single sampling plan and double sampling plan 5
 - (c) Acceptance rejection and acceptance rectification plans 4

Section - B

7. (a) What do you mean by family budget survey ? Explain the method of constructing Cost of living index numbers, also mention their uses. 6.5
 (b) What is an index number? Describe briefly the problem that are involved in the construction of an index number of prices. 6.5

TABLE : FACTORS USEFUL IN THE CONSTRUCTION OF CONTROL CHARTS

Sample size	Mean chart	Standard deviation chart	Range chart
n	Factors for control limits	Factors for central line	Factors for central line
	A A ₁ A ₂	B B ₁ B ₂ B ₃ B ₄	D D ₁ D ₂ D ₃ D ₄
2	2.121	0	0
3	1.232	0	0
4	1.500	0	0
5	1.342	0	0
6	1.225	0.026	0
7	1.134	0.105	0.076
8	1.061	0.167	0.136
9	1.000	0.219	0.184
10	0.949	0.262	0.223
11	0.905	0.299	0.256
12	0.866	0.331	0.284
13	0.832	0.359	0.308
14	0.802	0.384	0.329
15	0.775	0.406	0.348
16	0.759	0.427	0.364
17	0.742	0.445	0.379
18	0.727	0.461	0.392
19	0.711	0.477	0.404
20	0.697	0.491	0.414
21	0.685	0.504	0.425
22	0.674	0.516	0.434
23	0.662	0.527	0.443
24	0.652	0.538	0.452
25	0.640	0.548	0.459
26	0.626	0.555	0.469
27	0.612	0.565	0.478
28	0.600	0.574	0.486
29	0.588	0.582	0.493
30	0.577	0.589	0.500
31	0.566	0.595	0.506
32	0.555	0.600	0.511
33	0.544	0.605	0.516
34	0.533	0.610	0.521
35	0.522	0.615	0.526
36	0.511	0.620	0.531
37	0.500	0.625	0.536
38	0.489	0.630	0.541
39	0.478	0.635	0.546
40	0.467	0.640	0.551
41	0.456	0.645	0.556
42	0.445	0.650	0.561
43	0.434	0.655	0.566
44	0.423	0.660	0.571
45	0.412	0.665	0.576
46	0.401	0.670	0.581
47	0.390	0.675	0.586
48	0.379	0.680	0.591
49	0.368	0.685	0.596
50	0.357	0.690	0.601
51	0.346	0.695	0.606
52	0.335	0.700	0.611
53	0.324	0.705	0.616
54	0.313	0.710	0.621
55	0.302	0.715	0.626
56	0.291	0.720	0.631
57	0.280	0.725	0.636
58	0.269	0.730	0.641
59	0.258	0.735	0.646
60	0.247	0.740	0.651
61	0.236	0.745	0.656
62	0.225	0.750	0.661
63	0.214	0.755	0.666
64	0.203	0.760	0.671
65	0.192	0.765	0.676
66	0.181	0.770	0.681
67	0.170	0.775	0.686
68	0.159	0.780	0.691
69	0.148	0.785	0.696
70	0.137	0.790	0.701
71	0.126	0.795	0.706
72	0.115	0.800	0.711
73	0.104	0.805	0.716
74	0.093	0.810	0.721
75	0.082	0.815	0.726
76	0.071	0.820	0.731
77	0.060	0.825	0.736
78	0.049	0.830	0.741
79	0.038	0.835	0.746
80	0.027	0.840	0.751
81	0.016	0.845	0.756
82	0.005	0.850	0.761
83	0.000	0.855	0.766
84	0.000	0.860	0.771
85	0.000	0.865	0.776
86	0.000	0.870	0.781
87	0.000	0.875	0.786
88	0.000	0.880	0.791
89	0.000	0.885	0.796
90	0.000	0.890	0.801
91	0.000	0.895	0.806
92	0.000	0.900	0.811
93	0.000	0.905	0.816
94	0.000	0.910	0.821
95	0.000	0.915	0.826
96	0.000	0.920	0.831
97	0.000	0.925	0.836
98	0.000	0.930	0.841
99	0.000	0.935	0.846
100	0.000	0.940	0.851

This table is taken from "Fundamental of Applied statistics" by Gupta and Kapoor