

7. (a) What do you understand by a control chart? Give justification for using the 3σ control limits in the control charts.
- (b) In order to determine whether or not a production of bronze casting is in control, 20 sub-groups of size 6 are taken. It is found that $\bar{\bar{x}} = 3.126$ gm; and $\bar{R} = 0.009$ gm. Assuming that the process is in control, find upper and lower control limits for the sub-groups' means and ranges. (6,6)
8. (a) Define process and product control. Give justification for using 3σ control limits in the control charts.
- (b) Explain the construction of p and d- charts. Also, discuss the construction of control limits of p and d-charts for fixed and variable sample sizes.
- (c) The following are the numbers of defectives in 22 lots each containing 2,000 rubber belts :

425	430	216	341	225	322	280	306	337	305	356
402	216	264	126	409	193	326	280	389	451	420

Draw control chart for fraction defectives and comment on the state of control of the process. (4,4,4)

(1000)

[This question paper contains 6 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 6229 E

Unique Paper Code : 32375902

Name of the Paper : Applied Statistics

Name of the Course : **Generic Elective: Statistics**

Semester : IV

Duration : 3 Hours

Maximum Marks : 75

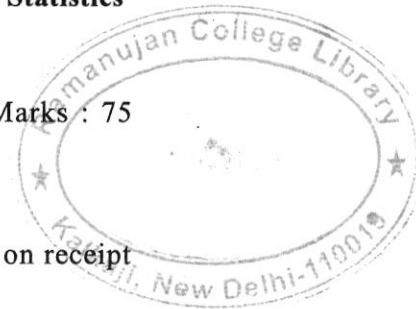
Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt **six** questions in all.
3. Question **1** is compulsory.
4. Select **two** questions from **Section A** and **three** from **Section B**.
5. Use of simple scientific calculator (non-programmable) is allowed.

Attempt any **three** parts :

1. (a) Define the following in context of a time series :
 - (i) Seasonal variation
 - (ii) Random component

P.T.O.



- (b) Define the following terms in relation to an index number :
- Price relatives
 - Quantity relatives
- (c) Differentiate between GRR and NRR. What are the main sources of errors while computing the GRR?
- (d) Explain how a control chart helps to control the quality of a manufactured product. Describe the construction of R-chart, when standard are not given. (3×5)

Section A

2. (a) If $L(p)$ and $L(q)$ denote Laspeyre's price and quantity index numbers respectively; and $P(p)$ and $P(q)$ denote Paasche's price and quantity index numbers respectively. Then show that

$$\frac{L(p)}{L(q)} = \frac{P(p)}{P(q)}$$

Also, show that if

$$A(p) = \frac{L(p) + P(p)}{2}$$

then $A(p) \geq F(p)$, where $F(p)$ is Fisher's ideal index.

OR

Which Death rates reveal glaring facts about various segments of the population? Describe in detail giving its merits and demerits.

- (c) Find the standardised death rate for the given data

Age (Years)	Standard Population		Population A	
	Population ('000)	Specific Death Rate	Population ('000)	Specific Death Rate
0-5	8	50	12	48
5-15	10	15	13	14
15-50	27	10	15	9
≥50	5	60	10	59

(3,3,6)

6. (a) What do you understand by Curate and Complete expectation of life? Show that (in the usual notations)

$$e_x^0 = \frac{T_x}{l_x}$$

- (b) Describe a life table along with its assumptions and the steps required for the construction of the life table.

- (c) Is Crude birth rate a probability ratio? Elaborate. (4,4,4)

P.T.O.

(b) Verify the results of the above part for the following data set :

Commodity	Base year price (p_0)	Base year quantity (q_0)	Current year price (p_1)	Current year quantity (q_1)
A	1	6	3	5
B	3	5	8	5
C	4	8	10	6

(6,6)

3. (a) What do you understand by secular trend of a time series model? Name some methods to measure trend. Obtain normal equations for measuring trend if the trend can be measured by a straight line.

(b) Using the equations obtained in the above part, measure the straight line trend for the following data :

Time (t)	1	2	3	4	5	6	7
Production (Y)	77	88	94	85	91	98	90

(6,6)

4. (a) On a certain date, the consumer price index for a certain class was 204.6. The percentage increase in the price in different categories over the base year are as follows :

P.T.O.

Class of expenditure	Percentage increase	Weight
Food	X	60
Clothing	220	12
Housing	65	16
Fuel and energy	110	8
Miscellaneous	125	4

Determine X.

(b) Identify the components of a time series mainly applicable in the following cases citing appropriate reasons :

- (i) Fire in a factory.
- (ii) Stubble burning after the crop season is over.
- (iii) Increasing population of a country.
- (iv) Increasing digital literacy. (5,7)

Section B

5. (a) Define Vital Statistics? How do you study Population trend and what is its significance?
- (b) Define Rates and Ratios of Vital events. What is the significance of the sex-ratio? Also explain why C.D.R. is not suitable for comparing the mortality rates of two places?