

[This question paper contains 4 printed pages.]

Sr. No. of Question Paper : 151

E

Your Roll No.....

Unique Paper Code : 237551

Name of the Course : B.A. (Prog.) Statistics

Name of the Paper : Applied Statistics

Semester : V

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, by selecting **Three** from each section.
3. Simple calculator can be used.

**SECTION – I**

1. (a) Define time series. Mention its important components. Describe method of least squares for measuring a trend line.  
(b) Name the characteristic movement of time series with which you will mainly associate
  - (i) A fire in factory that delays the factory's production for two weeks.
  - (ii) A fall in death rate due to scientific advancement.
  - (iii) Increase in demand for gift items during festivals.
  - (iv) New launches and phase out of gadgets from market. (8½,4)
2. (a) Explain additive and multiplicative models of time series.  
(b) Explain ratio to trend method for measuring seasonal variations.  
Using ratio to trend method, calculate seasonal index for the following data :

P.T.O.

Year/quarter	I	II	III	IV
2000	14	20	10	15
2001	12	19	11	15
2002	13	21	12	14

(4,8½)

3. (a) What is an index number? Discuss its importance and uses. Explain:  
 (i) time reversal test, and (ii) factor reversal test as applied to index numbers.  
 Show that Fisher's ideal index number formula satisfies both these tests.

- (b) Prepare price and quantity index numbers for 2005 with 2002 as base year from the following data (table) by using :

- (i) Laspeyre's, (ii) Paasche's and (iii) Fisher's methods.

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

With reference to the above, verify that the Factor Reversal Test and Time Reversal Test are satisfied by Fisher's formula. (6,6½)

4. (a) What is meant by cost of living index number? Mention at least three of its uses.
- (b) From the following data calculate price index numbers for 2005 with 1995 as base :

Commodities	1995		2005	
	Price	Qty.	Price	Qty.
A	20	8	40	6
B	50	10	60	5
C	40	15	50	15
D	20	20	20	25

- (i) Laspeyre's, (ii) Paasche's, and (iii) Fisher's formulae. (6,6½)

## SECTION - II

5. (a) Define the term 'Vital Statistics'. Describe their nature and the methods of collection of vital statistics.
- (b) Explain the difference between crude death rate and standardised death rate.
- (c) Calculate the crude and standardised death rates for the local population from the following data and compare them with crude death rate of the standard population.

Age-group	Standard population	Deaths	Local population	Deaths
0-10	600	18	400	16
10-20	1000	5	1500	6
20-60	3000	24	2400	24
60-100	400	20	700	21

(5,4,3½)

6. (a) Describe the various components of a life table.
- (b) Fill in the blanks in a portion of Life table given below :

Age (in years)	$l_x$	$d_x$	$p_x$	$q_x$	$L_x$	$T_x$	$e_x^0$
4	95,000	500	?	?	?	4,850,300	?
5	?	400	?	?	?	?	?

- (c) Define the followings :

- (i) Total Fertility Rate
- (ii) Gross Reproduction Rate
- (iii) Net Reproduction Rate

(4,4,4½)

P.T.O.

7. (a) What is meant by process control in industrial statistics ?
- (b) Explain how a control chart helps to control the quality of a manufactured product. Describe the basis of a control chart. Discuss major parts of control charts.
- (c) Explain clearly basis and working of control charts for mean and range. State the basis and assumptions on which  $\bar{X}$  and R-charts are developed.

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  $\bar{\bar{X}} = 3.126$  gm, and  $\bar{R} = 0.009$  gm.

- (i) Assuming that the process is in control, find upper and lower control limits for the sub groups means.
- (ii) Assuming that the process is in control, find upper and lower control limits for the sub-group ranges.

Given for  $n = 6$ ,  $A_1 = 1.410$ ,  $A_2 = 0.483$ ,  $D_3 = 0$ ,  $D_4 = 2.004$ . (2,4,6½)

8. (a) Distinguish between defect and defective. Give some examples of defects for which the c-chart is applicable. How do you calculate control limits for a c-chart? Discuss the assumptions and approximations involved in the calculations.
- (b) What do you understand by control chart for a fraction defective? Explain its construction. Give the theoretical distribution on which the control limits are based. (6,6½)