[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 $\overline{X}$ 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 $\overline{\overline{X}} = 3.126$ gm, and $\overline{R} = 0.009$ 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)