BACHELOR OF SCIENCE EXAMINATION, 2017

(1st Year, 1st Semester)

STATISTICS (Subsidiary)

Paper - 3-Stat

Full Marks : 50   Time : Two Hours

The figures in the margin indicate full marks.

(Notations / Symbols have their usual meanings)

Answer any *five* questions.

1. (a) Explain with example what you mean by a price index number. The following table gives the change in the price and consumption of three commodities in the workers' consumption basket. Compute Fisher's ideal index number.

Commodity	1950		1960	
	Price (Rs.)	Consumption (Units)	Price (Rs.)	Consumption (Units)
Wheat	100	10	110	6
Rice	150	15	170	18
Cloth	5	50	4	30

[*Turn over*]

(b) In 1976, the average price of a commodity was 20% more than in 1975, but 20% less than in 1974; and moreover, it was 50% more than in 1977. Reduce the data to price relatives using 1975 as base (1975 Price Relative = 100).

(c) Show that the simple aggregative type of index number satisfies the time reversal test but does not satisfy the factor reversal test.   5+2+3

2. (a) What are the tests to be satisfied by a good index number ? Prove using the following data that the factor reversal test is satisfied by Fisher's ideal index number :

	Rice		Wheat		Jowar	
Year	Price	Quantity	Price	Quantity	Price	Quantity
1949	4	50	3	10	2	5
1959	10	40	8	8	4	4

(b) Compute chain index numbers with 1970 prices as base, from the following table giving the average wholesale prices for the years 1970-74.

Average Wholesale Prices (Rs.)

Commodity	1970	1971	1972	1973	1974
A	20	16	28	35	21
B	25	30	24	36	45
C	20	25	30	24	30

(c) Determine the relative importance for the food group, given that the cost of living index number for 1975 with 1970 as base is 175 from the following figures :

Group	% increase in expenditure	Weight
Food	65	-
Clothing	90	12
Fuel etc.	20	18
Miscellaneous	70	10
Rent etc.	150	20

4+4+2

3. (a) What do you mean by a time series ? Explain the different components of such a series.

(b) For the following series of observations verify that the 4-year centered moving average is equivalent to a 5-year weighted moving average with weights 1, 2, 2, 2, 1 respectively.

[Turn over]

Year	1964	1965	1966	1967	1968	1969
Sales (Rs.'0000)	2	6	1	5	3	7

Year	1970	1971	1972	1973	1974
Sales (Rs.'0000)	2	6	4	8	3

(c) What do you understand by Seasonal Indices ? What methods are used to determine them ?   4+4+2

4. (a) Fit a straight line trend equation by the method of least squares and estimate the value for the year 1969.

Year	1960	1961	1962	1963	1964	1965	1966	1967
Value	380	400	650	720	690	600	870	930

(b) Find the seasonal indices by the method of moving averages from the following series of observations :

Sales of Woollen Yarn

(Rs. '000)

Quarter/Year	1959	1960	1961
I	101	106	110
II	93	96	101
III	79	83	88
IV	98	103	106

5+5

[*Turn over*]

5. (a) Fit a straight line trend to the following data. How would you obtain the monthly trend values from the trend line fitted to the yearly values ? Obtain trend values for December, 1950 and August, 1949.

Year	1946	1947	1948	1949	1950	1951	1952	1953	1954
Average Profit (million Rs.)	6.7	7.4	9.3	7.4	8.3	10.6	9.5	8.7	7.9

(b) Using the method of exponential smoothing, find forecasts for the following sales data, taking an initial forecast 25 and a smoothing coefficient 0.4.

Day	1	2	3	4	5	6	7	8
Sales	26	28	23	27	24	30	26	27

6+4

6. (a) Calculate (i) Crude Death Rate and (ii) Standardised Death Rate of District A, from the following data. Are the two rates equal ? If so, why ?

Age Group (years)	Population of District A	Deaths in District A	Standard Population
0-5	1000	50	10000
5-10	800	20	8000
10-25	1200	12	12000
25-45	3000	15	30000
45 & above	4000	52	40000

[*Turn over*]

(b) In the following life table, fill the blanks with the marked with query (?)

Age (x)	l_x	d_x	q_x	L_x	T_x	e_x^0
83	3560	?	0.16	?	?	?
84	?	?	0.17	?	11975	?

(c) Consider the following data :

$l_{40} = 81685$, $l_{50} = 74528$, $l_{60} = 62170$, $l_{70} = 42091$

Smith, aged 40, enters into partnership with Jones, aged 50. What is the probability that the partnership will continue undissolved by death for 20 years ? What is the probability that in the next 20 years Jones will die but Smith survive ?   4+4+2

7. (a) Calculate (i) General Fertility Rate (ii) Specific Fertility Rates and (iii) Total Fertility Rate, from the following data. It is given that out of 9000 births, the number of females is 4300.

Age group (yrs.)	16-20	21-25	26-30	31-35	36-40	41-45	46-50
No. of women ('000)	25	24	20	16	15	12	8
No. of live births	1140	3000	2740	1360	600	150	10

(b) Define Gross Reproduction Rate and Net Reproduction Rate. If the Total Fertility Rate is 2006 (per thousand)

[Turn over]

and sex ratio at birth is 1 male to 1 female then determine the Gross Reproduction Rate.

(c) Calculate (i) Gross Reproduction Rate and (ii) Net Reproduction Rate from the following data :

Age group (years)	Specific Fertility Rate per thousand females	Years lived by 1000 new-born girls
15-20	140	3600
20-25	250	3500
25-30	240	3400
30-35	190	3200
35-40	130	2900
40-45	50	2600
45-50	20	2300

Assume that the sex ratio at birth is 98 females per 100 males.   3+3+4

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