[4369] – 211

Seat No.	

S.Y. B.Com. Examination, 2013

BUSINESS STATISTICS

Special Paper – I

(New 2008 Pattern)

Time : 3 Hours Max. Marks : 80

***N.B.**: i) **All** questions are **compulsory**.*

*ii) Figures to the **right** indicate **full** marks.*

*iii) Use of calculator and statistical tables is **allowed**.*

1. A) Attempt **any four** of the following : **(2 each)**

a) Variance of a mesokurtic distribution is 4. Find μ_4.

b) Explain the uses of time series.

c) Define extrapolation.

d) What is an unbalanced assignment problem ?

e) Define independence of two attributes.

f) Write dual of the following LPP :

Maximize $Z = 5x_1 + 3x_2$

Subject to, $3x_1 + 2x_2 \leq 6$

$3x_1 + x_2 \leq 4$, $x_1, x_2 \geq 0$.

B) Attempt **any two** of the following : **(6 each)**

a) Find the initial basic feasible solution of the following transportation problem by North-West corner method. Also find its cost.

	W_1	W_2	W_3	W_4	**Capacity**
F_1	19	30	50	10	7
F_2	70	30	40	60	9
F_3	40	8	70	20	18
Demand	5	8	7	14	

b) The first four moments of a distribution about the origin are 1, 4, 10 and 46 respectively. Obtain the various characteristics of the distribution on the basis of this information. Comment upon the nature of the distribution on the basis of skewness and kurtosis.

c) Calculate three yearly moving averages for the following data relating to the number of beds occupied in a certain hospital during twelve months of a year.

Months	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
No. of beds	50	56	53	52	55	60	65	73	67	45	55	60

2. Attempt **any two** of the following : **(8 each)**

a) Use simplex method to solve the following LPP.

Maximize $Z = 3x_1 + 2x_2 + 5x_3$

Subject to the constraints :

$x_1 + x_2 + x_3 \leq 9$

$2x_1 + 3x_2 + 5x_3 \leq 30$

$2x_1 - x_2 - x_3 \leq 8$

$x_1, x_2, x_3 \geq 0$

b) With a view to determine meteorological factors which give rise to significant variation in yield per acre of crop, the observations on the following variables were recorded

Y_1 : Yield in kilograms

Y_2 : Rainfall in mm

Y_3 : Maximum temperature in °F.

The results obtained were as follows :

$\overline{Y}_1 = 103.9214$, $\overline{Y}_2 = 93.9714$, $\overline{Y}_3 = 99.7357$

$\sigma_1 = 24.4492$, $\sigma_2 = 45.4930$, $\sigma_3 = 2.9315$

$\gamma_{12} = 0.4104$, $\gamma_{13} = -0.7357$, $\gamma_{23} = -0.2326$

i) Obtain the equation of plane of regression of Y_1 on Y_2 and Y_3.

ii) Estimate Y_1 when $Y_2 = 98$ mm and $Y_3 = 90$ °F.

c) From the following data, find f (7.5) using Newton's method.

x	1	2	3	4	5	6	7	8
f (x)	1	8	27	64	125	216	343	512

3. Attempt **any two** of the following : **(8 each)**

a) Using Lagrange's Interpolation Formula find f (5). Given that

x	f (x)
1	2
2	4
3	8
4	16
7	128

b) i) Obtain the dual of the following LPP.

Maximize $Z = 2x_1 + 3x_2 + 4x_3$

Subject to , $3x_1 - 2x_3 \leq 41$

$2x_1 + x_2 + x_3 \leq 35$

$2x_2 + 3x_3 \leq 30$, $x_1, x_2, x_3 \geq 0$

ii) From the data given below, calculate Yule's coefficient of association between weight of children and their economic condition and interpret it.

	Poor children	Rich children
Below normal weight	75	23
Above normal weight	5	42

c) A firm produces x units of items per week at a total cost of

Rs. $\frac{x^3}{3} - x^2 + 5x + 6$.

Find :

i) The average cost.

ii) The average variable cost.

iii) The average fixed cost.

iv) The marginal average cost.

4. Attempt **any two** of the following : **(8 each)**

a) Find the initial basic feasible solution of the following transportation problem by VAM.

	X	Y	Z	Supply
A	11	21	16	14
B	7	17	13	26
C	11	23	21	36
Demand	18	28	25	

b) i) Name the four components of a time series. Explain any one of them.

ii) Define :

I) Ultimate class frequencies.

II) Break even point.

III) Marginal cost.

IV) Cost function.

c) From the following information calculate G.F.R. and T.F.R.

Age group	Female population ('000)	No. of live births
15 – 19	32	800
20 – 24	30	3420
25 – 29	28	4200
30 – 34	26	2860
35 – 39	24	1920
40 – 44	22	660
45 – 49	18	72

5. Attempt **any two** of the following : **(6 each)**

a) Estimate trend by fitting a straight line equation for the following series.

Year	1993	1994	1995	1996	1997
Sales (in '000 Rs.)	35	56	79	80	40

b) A company has to assign five jobs to five workers. The cost matrix is given below.

Jobs / Workers	I	II	III	IV	V
A	32	38	40	28	40
B	40	24	28	21	36
C	41	27	33	30	37
D	22	38	41	36	36
E	29	33	40	35	39

Find an optimal assignment for minimization of cost.

c) Compute the crude and standardized death rates in two cities from following data and find out which population is healthier. Take city B as the standard population.

Age	City A		City B	
	Population	Deaths	Population	Deaths
Under 5	16,000	176	5,000	130
5 – 40	50,000	250	27,000	162
40 – 75	1,20,000	840	62,000	527
Above 75	14,000	910	6,000	420