2015

DDE

M.Com. Part–I Examination

QUANTITATIVE TECHNIQUES FOR MANAGERIAL DECISIONS

PAPER—II

Full Marks : 100

Time : 4 Hours

The figures in the right-hand margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

Illustrate the answers wherever necessary.

Write the answer question of each Half in <u>separate books</u>.

First Half

(Business Statistics)

[Marks : 50]

Answer Q. No. 1 and any *two* from the rest.

1. Answer any *four* questions of the following :   4×5

   (a) (i) You are given that $Y = 480 + 10t + \cdot 8t^2$

(Origin 2014, t unit = 1 year, Y = Annual Production of sugar in tones) Shift the origin to year 2010.

(ii) Given the following equation :

$Y = 240 + 3 \cdot 8t$

(Origin year 2012, t unit = 1 year, y = Annual Production of Rice)

Shift the origin to 2013-14.

(b) Write the needs of time series analysis: Write the special feature of Irregular Component in time series.

(c) What is base year in index number ? How is the base year selected ?

(d) Establish the relationship between δ (Delta) and E operators. What is difference table in interpolation ?

(e) If $r_{12} = \cdot 87$, $r_{13} = \cdot 78$, and $r_{23} = \cdot 58$; find the partial correlation coefficient $r_{12 \cdot 3}$ and multiple correlation coefficient $r_{1 \cdot 23}$.

(f) 100 cricketers appeared in a trial match and 30 of them were successful. 23 cricketers received special coaching and out of them 12 cricketers were

successful. Using Yule's coefficient of association estimate the utility of speical coaching.   5

(g) Prove that Laspayres' and Paasche's index number can be derived as weighted arithmetic mean of price relatives and specify the weight.   3+2

(h) What do you mean by statistical quality control ? What is the main purpose of statistical quality control ?   3+2

2. (a) Find the quarterly trend values from the following data by the moving average method, use four quarters moving average period.

Quarterly Output (million tons)

Quarters/Year	2012	2013	2014
I	52	59	57
II	54	63	61
III	67	75	72
IV	55	65	60

(b) Calculate the Seasonal Index from the following data using the Average Method.

Year/Quarters	I	II	III	IV
2010	72	68	80	70
2011	76	70	82	74
2012	74	66	84	80
2013	76	74	84	78
2014	78	74	86	82

3. (a) Explain the time reversal test and factor reversal test of index numbers. Examine whether these tests are satisfied by Fisher's index number.

(b) From the following information calculate quantity index number using (i) Laspayres' formula and (ii) Paaschi's formula :

Commodities	Base year 2001		Current year 2010	
	Price (Rs.)	Quantity (Kg.)	Price (Rs.)	Quantity (Kg.)
A	5	50	10	56
B	3	100	4	120
C	4	60	6	60
D	11	30	14	24
E	7	40	10	36

8+7

4. (a) The following sums have been obtained from 100 observation pairs :

$$\sum x = 12500, \sum y = 8000, \sum x^2 = 1585000$$

$$\sum y^2 = 648100, \sum xy = 1007425$$

(i) Find the regression of y on x and estimate the value of y when x = 130.

(ii) Compute the correlation co-efficient between x and y.

(b) For the variables x and y the equations of two regression lines are $4x - 5y + 33 = 0$ and $20x - 9y = 107$. Identify the regression line of y on x and that of x on y.

(c) Deduce Spearman's formula for rank correlation coeficient :

$$R = 1 - 6\sum d^2 / n(n^2 - 1).$$

6+4+5

5. (a) Distinguish between Interpolation and Inverse Interpolation.

(b) Derive the Newton's Backward Interpolation formula and also state where it is applicable.

(c) Using Newton's Interpolation formula, find the number of factories earning less than Rs.65000 as profit, from the following data :

Profits (Rs. '000)	30-40	40-50	50-60	60-70	70-80
No. of Factories	34	43	56	39	29

3+7+5

Second Half

(Quantitative Techniques for Managerial Decisions)

[Marks : 50]

Answer Q. No. 6 and any *two* from the rest.

6. Answer any *four* of the following : 4×5

(a) Define operation research. Mention the significance of operation management. 2+3

(b) What is EOQ model ? What do you mean by set up cost and holding cost ? 2+3

(c) Demonstrate Vogel's Approximation Method (VAM) of obtaining Initial Feasible Solution for a Transportation problem.

(Continued)

(d) How would you slove an assignment problem where two jobs are to be assigned to a particular individual ? Explain with an example.

(e) Find the dual of the problem :

Minimize $Z = 90x_1 + 60x_2 + 80x_3$

Subject to constaints :

$x_1 + 2x_2 + 3x_3 \geq 3$

$2x_1 + x_2 + x_3 \geq 4$

$3x_1 + x_2 + 2x_3 \geq 1$

x_1 to $x_3 \geq 0$

(f) What is an artificial variable ? When and why is it used in solving a linear programming problem ?

(g) How will you deal with the situation if negative value of independent float or interfering float is obtained ? Distinguish between CPM and PERT. 2+3

(h) What do you mean by a 'non-empty queue'? How do you distinguish it from an 'empty queue'? How can the average lengths of such queues (both empty and non-empty) be determined ?

(Turn Over)

7. (a) How can an unbalanced transportation problem be balanced ?

(b) When is the initial feasible solution said to be an optimal solution ?

(c) A manufacturer has three distribution centres at P, Q and R. These centres have available 40, 20 and 40 units of his product. Retail outlets of v, w, x, y and z require 25, 10, 20, 30 and 15 units respectively. The transportation cost (in rupees) per unit between each centre and each outlet is given in the following table. Determine the cheapest distribution schedule.

Ditribution Centres	Retail Outlets				
	v	ψ	x	y	z
P	11	6	9	10	8
Q	7	6	10	9	12
R	10	12	11	7	6

3+2+10

8. (a) The owner of a chain of fast food restaurants is considering a new computer system for accounting and inventory control. A computer company send the

following information about the system installation.

Activity	Description	Immediate Predecessor	Optimistic Time (days)	Most Likely Time (days)	Pessimistic Time (days)
A.	Select the computer model	–	4	6	8
B.	Design input/output system	A	5	7	15
C.	Design monitoring System	A	4	8	12
D.	Assemble computer hardware	B	15	20	25
E.	Develop the main Programmes	B	10	18	26
F.	Develop input/output routines	C	8	9	16
G.	Create database	E	4	8	12
H.	Install the system	D,F	1	2	3
I	Test and implement	G,H	6	7	8

(a) Construct an arrow diagram for this problem, determine the critical path and state the expected project completion time.

(b) Determine the probability that the project will be completed in 55 days. 10+5

9. Formula liner programming model for the following problem and slove it using simplex method :

A company sells two types of fertilizers, one is liquid and the other is dry. The liquid fertilizer contains 2 units of chemical A and 4 units of chemical B per jar and the dry fertilizer contains 3 units of each of the chemical A and B per carton. The liquid fertilizer sells for Rs.3 per jar and the dry fertilizer sells for Rs.4 per carton. A farmer requires at least 90 units of the chemical A and at least 120 units of the chemical B for his farm. How many of each type of fertilizer should the farmer purchase to minimize the cost while meeting his requirements ?

2+13

10. (a) (i) What statistical assumptions are to be made in solving queuing problems ?

(ii) A medical store has one cashier who handles all the payments. On an average, the cashier can serve 20 customers per hour, who arrive at his counter randomly on an average rate of 18 per

hour. The management of the store noticed that the cashier was idle some of the time, but at times long queues formed at his counter and the customers complained against long waits. It was, therefore, decided to investigate the following :

(x) What is the average length of the waiting line to be expected under the existing servicing conditions ?

(y) How many customers would be expected to be in the service area (i.e., in line and being served)?

(z) What is the average length of time that a customer would be expected to wait to pay for his purchases ?

(b) Find the optimal order quantity q of a product for which the price breaks are as follows :

q	Price/Unit (Rs.)
$0 < q \leq 100$	54
$100 < q \leq 300$	52

$$300 < q \qquad 50$$

The monthly demand for the product is 500 units. The storage cost is 20% of the unit cost of the product and the ordering cost is Rs. 20 per order.