

2014

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 separate books.

First Half

(Business Statistics)

[Marks : 50]

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

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

(a) Identify the components name in Time Series of the following items with proper reasons.

(i) Increase in Sales of Ice cream in Summer Season.

(ii) Increase in Sales of Mobile phone in W.B.

(iii) Increase in Sales of food grains in W.B. due to flood in other states.

(iv) Rise in Sales of Garments in Puja Season.

(Turn Over)

- (v) Increase in Sales of gold due to rise in all economic activities of the country.
- (b) Prove that Paaschej's Price Index formula is the weighted harmonic mean of the price relative, where weight is the current year value.
- (c) In a group of 800 students, the number of married is 320. But of 240 students who failed, 96 belonged to the married group. Find out whether the attributes marriage and failure are independent? Use Yule's formula.
- (d) If $\gamma = \frac{1 - \sqrt{x}}{1 + \sqrt{x}}$, where $x = \frac{(A\beta)(\alpha B)}{(AB)(\alpha\beta)}$ then prove that Yule's co-efficient of association (Q) = $\frac{2\gamma}{1 + \gamma^2}$.
- (e) Write down the properties of Linear Regression.
- (f) With the help of operator E, find the value of $\log_{10} 666$ from the following :
- $\log_{10} 654 = 2.8156$, $\log_{10} 658 = 2.8182$,
 $\log_{10} 662 = 2.8209$.
- (g) The coefficient of rank correlation of marks obtained by 10 students in Statistics and Accountancy was found to be 0.8. It was later discovered that the difference in ranks in the two subjects obtained by one of the students was wrongly taken as 7 in stead of 9. Find the correct value of Spearman's rank correlation coefficient.
- (h) "Quality control does not always imply the highest standards of manufacture" — Comment.

2. (a) Write the salient features of Moving Average method in time series.
- (b) (i) You are given the following equation
 $Y = 980 + 2t + .8\bar{t}$ (Origin : year 2008
 Scale = 1 year)
 Shift the origin to year 2012
- (ii) Convert the following annual equation to monthly equation.
 $Y = 90 + .5t$ (Y = Annual Sales, Origin : Year 2010,
 $t = 1$ year)
- (c) Fit the straight line trend by the method of least squares.

Year	Reserves (Rs.)	Year	Reserves (Rs.)
2007-08	612	2011-12	1001
2008-09	719	2012-13	1106
2009-10	820	2013-14	1231
20010-11	907		

$$3 + (2+2) + 8$$

3. (a) Distinguish between partial and multiple correlation.
- (b) Calculate $r_{1.23}$, when $r_{12} = 0.7$, $r_{13} = 0.72$ and $r_{23} = 0.52$.
- (c) Ten hand-writings were ranked by two judges in a competition. The rankings are given below :

	Hand-writing									
	A	B	C	D	E	F	G	H	I	J
Judge—I :	3	8	5	4	7	10	1	2	6	9
Judge—II :	6	4	7	5	10	3	2	1	9	8

Calculate Kendall's Tau (τ) to measure the closeness of the two rankings.

- (d) Given that the means of X and Y are 65 and 67 respectively. Their standard deviations are 2.5 and 3.5 and the coefficient of correlation between them is 0.8.

(i) Write down the two regression equations.

(ii) Obtain the best estimate of X, when Y = 70.

$$3+2+6+4$$

4. (a) Show that

$$\frac{L(P)}{L(Q)} = \frac{P(P)}{P(Q)} = Von$$

Where L (P) \Rightarrow Laspeyers Price Index

L (Q) \Rightarrow Laspeyers Quantity Index

P (P) \Rightarrow Paaschees Price Index

P (Q) \Rightarrow Paaschees Quantity Index

Von \Rightarrow Value Index

- (b) Construct index number of Price from the following data applying.

(i) Laspeyers method,

(ii) Paaschees method,

(iii) Drobish-Bowleys method,

(iv) Fishers Ideal method, and

(v) Edgeworth-Marshall method.

Commodity	2010		2013	
	Price (Rs.)	Quantity (K.G.)	Price (Rs.)	Quantity (K.G.)
A	2	8	4	6
B	5	10	6	5
C	4	14	5	10
D	2	19	2	13

$$5+(2 \times 5)$$

5. (a) What do you understand by Statistical Quality Control? What are its need and utility?

(b) From the following table, determine $e^{0.1245}$, applying Newton's Forward Interpolation method.

x :	0.12	0.13	0.14	0.15	0.16	0.17	0.18	0.19
e^x :	0.1274	1.1388	1.1502	1.1618	1.1735	1.1853	1.1972	1.2092

- (c) Write down the advantages of Lagrange's Interpolation method over the Newton's method.

$$5+6+4$$

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 : 5×4

(a) How can you solve a problem of assigning jobs to individuals in the following situations ?

(i) an individual can not perform a particular job, and

(ii) an individual can perform only a particular job.

(b) Explain shadow price in the content of linear programming problem.

(c) What are the components of 'Ordering Cost' and 'Carrying Cost' in relation to inventory problem ? How do they behave ?

(d) Explain with the help of an example the situations when you have to take the help of 'dummy' in solving an assignment problem.

(e) What do you understand by the terms 'direct cost' and 'indirect cost' in PERT ? How do they behave in project cost ?

(f) What do you understand by 'Loop' in a Transportation problem ? Explain with an example.

(g) What statistical properties are usually assumed as to the arrival pattern of the arriving units and of the inter-arrival times between each two successive arrivals ?

(h) Write the dual of the following linear programming problem:

$$\text{Minimize } Z = X_1 + X_2 + X_3$$

$$\text{Subject to } X_1 - 3X_2 + 4X_3 = 5$$

$$X_1 - X_2 \leq 3$$

$$2X_2 - X_3 \geq 4$$

where $X_1, X_2 \geq 0$ and X_3 is unrestricted.

7. (a) In a warehouse the annual demand for an item is 12,500 units. The ordering cost is Rs. 5 per order. The inventory carrying cost is 25% per annum. There are three price breaks. Orders in the range of 1,000 - 4,999 units cost Re. 0.48 per unit, 5,000 - 9,999 Re. 0.42 per unit, and for 10,000 or more units Re. 0.36 per unit. What quantity should be ordered to minimize total annual cost ?

(b) Discuss the terms : Traffic Intensity, Balking, Reneging, and Jockeying.

(c) What is Artificial Variable ? How is it used in Linear Programming ?

6+4+5

8. (a) Three product — X, Y and Z are produced in two plants — A and B. The demand for the products, operating cost per hour for each plant and hourly production of each product at each plant are given below :

Plants	Hourly Production			Operating Cost per hour Rs.
	X	Y	Z	
A	2	4	3	9
B	4	3	2	10
Demand	50	24	60	

Find the optimum operating hours of each plant by formulating a linear programming problem.

- (b) How would you resolve a tie situation while selecting the departing variable in linear programming problem?

9. The monthly maintenance work in a machine shop consists of 10 steps A to J. The interrelationship between them are identified by event numbers :

Steps	Event Numbers	Duration (Days)
A	1-2	3
B	2-3	5
C	2-4	8
D	3-5	4
E	3-6	2
F	4-6	9
G	4-7	3
H	5-8	12
I	6-8	10
J	7-8	6

- (a) Draw a Network.
 (b) Compute early and late start and finish time for each activity.
 (c) How much slack does Activity (3-5), Activity (4-6) and Activity (7-8) have?
 (d) Identify the critical path and critical activities.
 (e) If Activity (2-3) takes 8 days instead of 5 days, what will be the project completion time?
 (f) Identify the activities that have a free slack.

$$3+3+2+3+2+2$$

10. (a) A company solicits bids on each of four projects from five contractors. Only one project may be assigned to any contractor. The bids received (in thousands of rupees) are given in the accompanying table. Contractor D feels unable to carry out project 3 and, therefore, submits no bid.

Project	Contractor				
	A	B	C	D	E
1	18	25	22	26	25
2	26	29	26	27	24
3	28	31	30	—	31
4	26	28	27	26	29

- (i) Use the Hungarian method to find the set of assignments with the smallest possible total cost.
- (ii) What is the minimum total achievable cost?
- (b) Distinguish between Slack and Float. What are the different types of Float?

$$(8+2)+(2+3)$$

Cost Matrix					Project
1	2	3	4	5	
25	15	25	25	15	1
20	15	20	20	15	2
15	10	15	15	10	3
10	10	10	10	10	4