

2008

(December)

MASTER OF BUSINESS ADMINISTRATION

(Distance Learning)

[First Semester]

(Quantitative Methods)

PAPER—CP 103

Full Marks : 100

Time : 3 hours

The figures in the right-hand margin indicate marks

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

**Write the answers Questions of each Half
in separate books**

FIRST HALF

[Marks : 50]

(Turn Over)

1. Answer any *four* questions:

5 × 4

(a) Draw line diagrams of the following statistical information with regard to exports and imports, and comment on their relationship:

Year	Value of exports at 1987-88 Prices (Rs. Crores)	Value of imports at 1987-88 Prices (Rs. Crores)
1997-98	301	243
1998-99	295	226
1999-2000	309	230
2000-2001	260	184
2001-2002	276	168
2002-2003	184	85
2003-2004	158	89
2004-2005	182	177

(b) Compute the median and the upper quartile of the following:

Intelligence

Quotient (IQ) : 55-64 65-74 75-84 85-94

No. of Students : 2 20 79 184

Intelligence

Quotient (IQ) : 95-104 105-114 115-124

No. of Students : 302 207 82

(c) Prove that the standard deviation is independent of any change of origin, but is dependent on change of scale.

(d) Find the coefficient of skewness on the basis of Mean, Mode and Standard Deviation :

X : 14.5 15.5 16.5 17.5 18.5 19.5

f : 35 40 48 100 125 87

(e) Calculate the Seasonal Index from the following data using the Average Method :

Year/Otrs	I	II	III	IV
2004	72	68	80	70
2005	76	70	82	74
2006	74	66	84	80
2007	76	74	84	78
2008	78	74	86	82

(f) Three boxes of the same appearance have the following proportions of white and black balls:

Box I : 1 white and 2 black;

Box II : 2 white and 1 black;

Box III : 2 white and 2 black.

One of the boxes is selected at random and one ball is drawn randomly from it. It turns out to be white. What is the probability that the third box is chosen?

2. Answer any *two* questions: 10×2

(a) (I) State in each case whether you would expect to find a positive or negative or no correlation;

(i) Amount of rainfall and yield of crop,

(ii) Shoe size and intelligence,

(iii) Insurance companies' profits and the number of claims they have to pay,

(iv) Years of education and income.

(II) While calculating the coefficient of correlation between two variables x and y , the following results were obtained:

$n=25$, $\Sigma x=125$, $\Sigma y=100$, $\Sigma x^2=650$,
 $\Sigma y^2=460$, $\Sigma xy=508$. It was however

later discovered at the time of checking that two pairs of observations (x, y) were copied $(6, 14)$ and $(8, 6)$ while the correct values were $(8, 12)$ and $(6, 8)$ respectively.

Determine the correct value of the coefficient of correlation. 2 + 8

(b) (I) Find the mean of binomial distribution with parameters n and p .

(II) In a certain factory blades are manufactures in packets of 10.

There is a .2% probability for any blade to be defective. Using Poisson distribution calculate approximately the number of packets containing two defective blades in a consignment of 20,000 packets (Given that $e^{-.02} = .9802$). 5 + 5

(c) (I) Show that Fisher's Index formula satisfies both the Time Reversal and Factor Reversal test.

(II) Compute the consumer price index number for 2008 on the basis of year 2000 from the following data using family budget method:

Items	Price in 2008 (Rs.)	Price in 2000 (Rs.)	Weights
Food	200	280	30
Rent	100	200	20
Clothing	150	120	20
Fuel and Lighting	50	100	10
Miscellaneous	100	200	20

5 + 5

[*Internal Assessment* : 10 Marks]

SECOND HALF

[Marks : 50]

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

(a) How does the problem of degeneracy arise in a transportation problem? How can you resolve such degeneracy?

(b) Choose the correct answer with arguments and explain the correct answer graphically:

'At EOQ level, the ordering cost and carrying cost are:

(i) equal,

(ii) such that ordering costs are more than carrying costs,

(iii) such that carrying costs are more than ordering costs,

(iv) not related in any way.'

- (c) Explain the term 'artificial variable' as it is used in linear programming. What are its uses ?
- (d) What is traffic intensity ? What happens to the queue length when traffic intensity is (i) less than 1, (ii) equal to 1, and (iii) greater than 1 ?
- (e) A Xerox machine in an office is operated by a person who performs other jobs also. The average service time for a job is 6 minutes per customer. On an average, every 12 minutes, the customer arrives for photocopying. Determine the following:
- (i) Average queue length,
 - (ii) Average length of non-empty queues,
 - (iii) Mean waiting time of an arrival,
 - (iv) Average number of customers in the system.

(f) With the help of an imaginary example, explain the process of conversion into dual form of a linear programming problem.

4. Answer any *two* of the following questions: 10×2

(a) Formulate a linear programming model for the following problem and solve it:

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

- (b) A company has three warehouses W_1 , W_2 and W_3 . It is required to deliver a product from these warehouse to three customers A , B and C . The table below shows the costs of transporting one unit from warehouse to customer, stock in warehouse and customer requirements:

		Warehouse			Units
		W_1	W_2	W_3	
Customer	A	5	7	8	70
	B	4	4	6	30
	C	6	7	7	50
Units		65	42	43	

Find the optimal transportation schedule.

- (c) (i) Explain shadow price in linear programming.
- (ii) Find the optimal order quantity for the following price-break inventory problem:

Annual demand — 200 units, Carrying charges — 20% p.a., Ordering cost — Rs. 20 per order.

Quantity (Q)	Price (Rs. per unit)
$Q < 50$	10.00
$50 \leq Q < 100$	9.00
$100 \leq Q$	8.00

[*Internal Assessment* : 10 Marks]
