2007

COMMERCE

FIFTH PAPER

(Quantitative Methods in Business)

Full Marks: 80

Time: 3 hours

The figures in the margin indicate full marks
for the questions

Answer Question Nos. **1** and **2** and any **three** from the rest

1. Answer the following questions:
(a) Fill in the blank:
Sampling errors are not present in _____.
(b) Choose the correct answer:

If the correlation between two variables X and Y is negative, then the regression coefficient of X on Y is

i) Positive
ii) Negative
iii) either positive or negative
iv) zero

(c) What is the range of Karl Pearson's correlation coefficient? 1
(d) Select the correct alternative out of the given ones: 2
Index number is a

i) measure of relative changes
ii) special type of average
iii) percentage relative
iv) All the above

(e) Mention two control charts for variables. 1
{f} What are the parameters of binomial distribution? 1
(g) Define feasible region associated with the solution of LP problems by graphical method. 1
(h) State whether the following statement is *True or False*: 1

"Linear programming deals with problems involving only a single objective."

2. Answer any five of the following questions: 5×5=25

a) Enumerate the various steps in sample survey.
b) State the multiplicative law of probability and illustrate it with an example.

c) If 5% of electric bulbs manufactured by a company are defective, use Poisson distribution to find the probability that in a sample of 100 bulbs (i) none is defective, (ii) 5 bulbs are defective. (Given $e^{-5} = 0 . 007$)

d) What are the characteristics of normal distribution?

e) Discuss in brief the problems of inventory management.

f) Write a note on Pareto's law of income distribution.

g) Two persons X and Y were asked to rank 7 different types of perfumes. The ranks given by them are as follows:

Perfumes:	A	B	C	D	E	F	G
X:	2	1	4	3	5	7	6
Y:	1	3	3	4	5	6	7

Obtain rank correlation coefficient.

3. (a) A problem in Statistics is given to five students A, B, C, D and E. Their probabilities of solving it are ½, ⅓, ¼, ¼ and 1/5 respectively. What is the probability that at least one student will be able to solve the problem? 7

(b) The distribution of monthly incomes of 500 workers is assumed to be normal with mean of Rs 2,000 and standard deviation of Rs 200. Estimate the number of workers with incomes-

i) exceeding Rs 2,300 p.m.;

ii) between Rs 1,800 and Rs 2,300 p.m.

What is the lowest income of the 25% workers in the highest income group?

[Given: Z = 0.67 1.00 1.50

Area = 0.25 0.3413 0.4322] 3+3+2=8

4. (a) Obtain Karl Pearson's correlation coefficient for the following bivariate distribution: 7

x :	1	2	3	4	5	6	7	8	9
y :	9	8	10	12	11	13	14	16	15

(b) Explain the concept of regression. What are regression equations and regression lines? Why there are usually two regression lines? When do they coincide?

3+2+2+ 1 =8

5. (a) What are type- I error and type-II error associated with tests of significance? Explain the concept of level of significance. 5+2=7

(b) Two sample poles of votes for two candidates A and B for a public office are taken, one from among the residents of urban areas and the other from the residents of rural areas. The results are given below. Use chi-square test to examine whether the nature of the area is related to voting preference in this election:

Votes For	A	B	Total

Rural	620	380	1000
Urban	550	450	1000
Total	1170	830	2000

Given: $X^2_{0.05}(1) = 3.84$ 8

6. (a) A company requires 10000 units of raw materials per annum. The cost per order is estimated to be Rs 50. The storage cost is estimated to be Rs.5,00 per unit of average inventory. What quantity should be ordered so that the total cost is minimum? Find also the total minimum cost excluding the purchase cost. 5+3=8

(b) What is a control chart? Explain the background of 3cr control limits for a control chart. 4+3=7

7. (a) Discuss the advantages and disadvantages of OR models. 7

(b) Solve the following LPP by graphical method: 8

Maximize $Z = 40x + 80y$

subject to

$2x+3y \leq 48$

$x \leq 15$

$y \leq 10$

$x, y \geq 0$

8. (a) Solve by simplex method : 10

Maximize $Z = 3x_1 + 2x_2 + 5X_3$

subject to

$x_1+2x_2+x_3 \leq 430$

$3x_1 + 2x_3 \leq 460$

$x_1+4x_2 \leq 420$

$x_1, x_2, x_3 \geq 0$

(b) Write a note on the role and limitations of simulation. 5