The Institute of Chartered Accountants [Ghana]

MAY 2005
EXAMINATIONS
(PROFESSIONAL)

QUANTITATIVE TECHNIQUES
(Special Paper)

Attempt Five (5) Questions

Time Allowed: 3 Hrs.

QUESTION 1

a) i.   What is meant by a non-parametric test of hypothesis?

    ii.   Give ONE advantage and ONE disadvantage of a non-parametric test.

                                                                    (4 marks)

b) A firm of Management Consultants has acquired a computer package with the aim of predicting the risk of bankruptcy using financial ratios taken from company accounts and other sources. The data below show, for small businesses, the risk of bankruptcy by type of business.

Type of Business	Risk of Bankruptcy		
	Low risk	High risk	Very high risk
Retail	150	130	120
Service	20	15	15
Manufacturing	10	15	25

The consultants wish to ascertain whether any relationship exists between type of business and risk of bankruptcy.

Required:

    i.   Formulate the appropriate hypotheses;
    ii.   Test the above hypotheses at a level of significance of 5%.

                                                                    (16 marks)
                                                        (Total: 20 marks)

QUESTION 2

a)   The total cost function of a manufacturer is:

$$TC = 1,400 + 30X$$

where   TC   represents total cost in thousand cedis

              X   represents quantity produced and sold in units.

The manufacturer's demand function is also given by:

$$P = 190 - 2x$$

where   P   represents price per unit in thousand cedis
              X   represents quantity produced and sold in units.

Required:

Obtain the manufacturer's breakeven point(s).   (5 marks)

b)   An accountant has estimated that the total weekly cost of production for a product is given by the function:

$$TC = 100 + 25x + \frac{x^2}{2}$$

where   TC is the total weekly production cost (in ¢'000)
                  X is the number of cartons of the product produced weekly.

The total weekly revenue is given by:

$$TR = 100X - X^2$$

where   TR is the total weekly revenue (in ¢'000)

                  X is the number of cartons of the product produced weekly.

Required:

Determine:

i.   the production level at which profit is maximized.   (5 marks)

ii.   the maximum profit.   (2 marks)

iii.   the price per carton that must be charged for maximum profit.

     (3 marks)

iv.   the point elasticity of demand at the output level that maximizes profit. Interpret your answer.

     (5 marks)
     (Total: 20 marks)

QUESTION 3

A manufacturer of tennis racket has been convinced by his distributor that there is an existing market for both a medium-priced racket bag (referred to as a standard model) and a high-priced racket bag (referred to as a deluxe model). The distributor is so confident of the market that if the manufacturer can make the bags at a competitive price, she would purchase all the bags the manufacturer can manufacture over the next three months.

A careful analysis of the manufacturing requirements resulted in the following table, which shows the production time requirements for the four required manufacturing operations and the Accounting department's estimate of the profit contribution per bag.

Product	Production Time (hours)				Profit per Bag
	Cutting and Dyeing	Sewing	Finishing	Inspection and Packaging	
Standard	7/10	½	1	1/10	¢10,000
Deluxe	1	5/6	2/3	¼	¢9,000

The director of manufacturing estimated that 630 hours of cutting and dyeing time, 600 hours of sewing time, 708 hours of finishing time, and 135 hours of inspection and packaging time will be available for the production of tennis racket bags during the next three months. The Company wishes to maximize profit.

Required:

a)   Formulate the linear programming model for the above problem.

(6 marks)

b)   Draw a graph of the problem and indicate the feasible region.

(7 marks)

c)   Determine the number of bags of each model that must be manufactured to achieve the objective of profit maximization.

(3 marks)

d)   State the maximum profit.   (1 mark)

e)   What is the slack time in each operation?   (3 marks)
(**Total: 20 marks**)

QUESTION 4

The Management Accountant of a Manufacturing Company has obtained the following weekly output of the company's product:

Week	1	2	3	4	5	6	7	8	9	10
Output, x (thousand units)	20	2	4	23	18	14	10	8	13	8
Total Cost, y, (¢'m)	60	25	26	66	49	35	35	18	40	33

Required:

a) Find the least squares regression equation of total cost on output.

(11 marks)

b) What are the fixed cost and variable cost per unit of the Company?

(2 marks)

c) Next week, the company plans to produce 22,000 units of the product. Use your regression equation to estimate the total cost of producing this quantity.

(2 marks)

d) Calculate the product-moment correlation coefficient.   (3 marks)

e) Using your answer in (d), comment on the reliability of your forecast in (c) above.

(2 marks)
(Total: 20 marks)

QUESTION 5

a) State the purpose of using matrices in business computations.

(2 marks)

b) A building contractor has accepted orders for three types of houses given in the Table A below:

Table A

	Type X	Type Y	Type Z
No. of houses	5	7	12

The contractor is familiar with the kinds of raw materials that go into each type of house. These raw materials are steel, wood, glass, paint and labour. The various

quantities of steel, wood, glass, paint and labour (in hours) required to build each type of house are identified in appropriate units for each type by Table B given below:

Table B

Type of house	Steel	Wood	Glass	Paint	Labour
X	5	20	16	7	17
Y	7	18	12	9	21
Z	6	25	8	5	13

The cost per unit (in ¢'000) for the raw materials is summarized in Table C.

Table C

	Steel	Wood	Glass	Paint	Labour
Cost per unit (in ¢'000)	15	8	5	1	1.5

Required:

i. Present the information in Tables A, B, and C in matrix form and denote them by A, B and C respectively.

(3 marks)

iii. Obtain the result of the product AB, showing clearly all the steps. Explain what this product represents.

(10 marks)

iv. Obtain the result of the product (AB) C, showing clearly all the steps. Explain what this product represents.

(5 marks)
(Total: 20 marks)

QUESTION 6

The Accra Arts Centre is a well known market for handicraft products. Tourists to the Country patronize these products highly. A sample of 50 handicraft dealers at the Accra Arts Centre revealed the following sales last year.

Sales (¢'m)	Number of Dealers
200 up to 240	5
240 up to 280	7
280 up to 320	9
320 up to 360	16
360 up to 400	10
400 up to 440	3

Required:

i.   Draw an ogive of the distribution of the distribution.   (6 marks)

ii. Using your ogive, determine the median of the distribution.   (2 marks)

iii. Calculate the coefficient of skewness of the distribution.   (9 marks)

iv. Comment on your result in (iii) above.   (3 marks)

(Total: 20 marks)