BINDURA UNIVERSITY OF SCIENCE EDUCATION

MASTERS IN BUSINESS LEADERSHIP MBL528

BUSINESS STATISTICS AND MANAGEMENT SCIENCE

December 2022
Time : 3 hours

Candidates should attempt all questions in Section A and at most THREE Questions from Section B. Each question should start on a fresh page. Marks will be allocated as indicated.

SECTION A (40 marks)

Candidates may attempt ALL questions being careful to number them A1 to A3.

A1. Define the following terms:

(a) statistic, [2]

(b) confidence interval, [2]

(c) level of significance, [2]

(d) Type I error, and [2]

(e) Type II error. [2]

A2. A manufacturer has advertised washing powder for sale in packages weighing 30kg on average. The manufacturer is worried that if he sells packages weighing less than 30kg on average it will lose contacts; and if he sells more than 30kg on average he will waste the product. A sample of 75 packages has produced an average weight of 29kg. Assuming that the packages have a standard deviation of 1.5kg.

(a) Find the 95% confidence interval for the mean weight of packages. [5]

(b) State the null and the alternative hypothesis. [2]

(c) Determine if the sample mean weight of 29kg should be acceptable to the manufacturer. [5]

A3. (a) Relationships between variables can be determined using several terms. Explain the meaning of each of the following

(i) Correlation is $r = 0.80$, [5]

(ii) The regression model is y = 1.44 + 0.74X [5]

(b) Decisions are made after analysing the data collected from a system. Explain how a linear programming problem helps if you want to allocate rsources optimally. marks8

SECTION B (60 marks)

Candidates may attempt THREE questions being careful to number them B4 to B6.

B4. (a) Explain the difference between correlation and regression. [5]

(b) The yield of a chemical process is related to the concentration of the reactant. An experiment has been conducted with the following results.

$Yield(y)$	$Concentration(x)$
81	1.00
89	1.00
83	2.00
91	2.00
79	1.00
87	1.00
84	2.00
90	2.00

(c) Obtain the regression model. [8]

(d) Use regression to test if there is a linear relationship. ($\alpha = 0.05$) [7]

B5. The sales department indicates that the sales potential for products 1 and 2 eceeds the maximum production rate and that the sales potential for product 3 is 20 units per week. the unit profit would \$50, \$20, and \$25 respectively on products 1, 2 and 3.Given the data below the objective is to determine how much of each product the firm should produce to maximize profit.

Machine type	*Product* 1	*Product* 2	*Product* 3
Milling machine	9	3	5
Lathe	5	4	0
Grinder	3	0	2

(a) Formulate the linear programming problem. [10]

(b) As a manager and without solving this problem justify the use of linear programming to solve it. [10]

B6. (a) Explain why you need to use inventory control models. [7]

(b) Give the meaning of the following terms,

(i) inventory, [2]

(ii) holding cost, and [2]

(iii) shortage cost. [2]

(c) A company stocks an item that is consumed at the rate of 50 units a day. It costs the company \$20 each time an order is placed. A unit inventory held in stock for a week costs \$0.70. Assuming that there are no shortages, determine the optimum number of orders the company has to place every year. [7]

B7. (a) Explain the meaning of the following decision criteria:

(i) maximax, [3]

(ii) Bayes rule, [3]

(b) A company is considering developing and marketing a new product. It is estimated to be twice as likely that the product would prove to be successful as unsuccessful. If it were successful, the expected profit would be \$1 500 000. If it is unsuccessful the expected loss is \$1 800 000. A marketing survey that costs \$300 000 can be conducted to predict whether product would be successful. Past experience with such surveys shows that successful products have been predicted to be successful 80% of the time whereas unsuccessful product have been predicted to be unsuccessful 70% of the time

(i) Using revenue minus costs as payoff construct the decision tree. [12]

(ii) Which action maximizes the expected payoff? [3]

END OF EXAMINATION PAPER.