BINDURA UNIVERSITY OF SCIENCE EDUCATION

FACULTY OF COMMERCE

GRADUATE SCHOOL OF BUSINESS

MASTER OF BUSINESS LEADERSHIP

BUSINESS STATISTICS AND MANAGEMENT SCIENCE(MBL528)

EXAMINATION PAPER

DURATION: 3 HOURS

Instructions and information to Candidates

1. Answer all questions.

3. The paper carries six questions.

4. All questions in Section B carry equal marks of 20 each.

5. The use of cell phones is not allowed in the examination.

6. Authorized Materials: Non programmable Electronic Calculator & Mathematical Instruments

---

SECTION A (40 marks)

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

A1. Define the following terms:

(a) Null hypothesis, [2]

(b) Alternative hypothesis, [2]

(c) Confidence interval, and [2]

(d) Critical region. [2]

A2. Suppose we want to compare the means of 2 samples $n_1 = 10$, $n_2 = 7$ with means $\bar{x} = 4.2$ and $\bar{y} = 3.4$ and variances $s_1^2 = 49$ and $s_2^2 = 32$ respectively.

(a) State the formulae for finding the 95% confidence interval for the difference between 2 means. [3]

(b) Find the 95% confidence interval for the difference between the 2 means $\bar{x} - \bar{y}$. [6]

(c) State the null hypothesis for testing the difference between 2 means. [3]

(d) Test the hypothesis that the means are equal. [6]

A3. Given the following data from an experiment where we have variables x and y.

x	y
3.0	3.3
3.5	4.1
4.2	5.6
4.8	5.2
5.0	5.9
5.1	5.5

(a) State the model that is being estimated. [2]

(b) Write down the model estimation formula. [2]

(c) A regression model was fitted to the data and yielded the following in SPSS

ANOVA

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	4.280	1	4.280	20.066	.011
Residual	.853	4	.213		
Total	5.133	5			

a Dependent Variable: y

b Predictors: (Constant), x

Coefficients

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1 (Constant)	.353	1.040		.339	.752
x	1.074	.240	.913	4.479	.011

a Dependent Variable: y

(i) From the SPSS output above obtain the regression model and state whether all parameters are significant. [2,2]

(ii) Interpret the ANOVA table and state if regression is significant. [4]

A4. (a) Briefly explain the uses of inventory control. [2]

(b) A company stocks an item that is consumed at the rate of 80 units a day. It costs the company \$30 each time an order is placed. A unit inventory held in stock per day costs \$0.90. Assuming that there are no shortages, determine the optimum order quantity. [6]

SECTION B (60 marks)

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

B5. Reddy Mikks produces both interior and exterior paint from 2 raw materials $M1$ and $M2$. The following table shows

	Tons of Raw Material		
Resource	*ExteriorPaint* 1	*InteriorPaint* 2	*Maximum daily Availability(tons)*
Raw Material(M1)	6	4	24
Raw Material(M2)	1	2	6
Profit per unit	\$5	\$4	

A market survey indicates that the daily demand of interior paint cannot exceed that of exterior paint by more than 1 ton. Also, the maximum demand daily for interior paint is 2 tons.

(a) Formulate the linear programming problem. [4]

(b) Use the graphical method to determine the optimal resource allocation. [6]

(c) Use the simplex method to determine the optimal daily resource allocation for each activity. [8]

(d) State the best decision for the manager. [2]

B6. (a) Define the following:

(i) minimax, and [2]

(ii) expected value criterion. [2]

(b) The manager of Glo Chemicals must decide whether to process a chemical or to contract it out at a cost of \$20 000. The final product batch will be sold for \$40 000. In-house processing involves direct costs for raw materials of \$4 000 and the first step, costing \$2 000, is chlorosulfanation, for which there is an 80% chance of getting a satisfactory intermediate chemical base. If the base is unsatisfactory, there will be insufficient time to start a new batch, but there will still be a chance of turning down the order or contracting out the production. In the latter case, there is 60% chance of being too late and having to dump the product. The last stage of in-house processing may be a low-temperature one costing \$10 000 and a 30% chance of failure resulting in the final product being dumped or a high temperature one costing \$16 000 which is certain to work.

(i) Using revenue minus costs as payoff construct the manager's decision tree. [13]

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

B7. (a) Define a transportation problem. [4]

(b) What is the aim of Vogel's method. [2]

(c) Perform one iteration of Vogel's approximation method to solve the following transportation problem.

Supplier	Destination					Supply
	1	2	3	4	5	
1	2	4	6	5	7	4
2	7	6	3	M	4	6
3	8	7	5	2	5	6
4	0	0	0	0	0	4
Demand	4	4	2	5	5	

[8]

(d) Describe a Transshipment problem. [6]

END OF EXAMINATION PAPER.