BINDURA UNIVERSITY OF SCIENCE EDUCATION

MASTERS IN BUSINESS LEADERSHIP   MBL528

BUSINESS STATISTICS AND MANAGEMENT SCIENCE

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) Measure of central tendency,   [2]

   (b) Null hypothesis,   [2]

   (c) Type I Error,   [2]

   (d) Confidence interval, and   [2]

   (e) level of significance.   [2]

A2. Suppose that you have two independent random samples $X_1, X_2, \cdots, X_{10}$ and $Y_1, Y_2, \cdots, Y_8$ from distributions $N(\mu_1, \sigma_1^2)$ and $N(\mu_2, \sigma_2^2)$ where $\bar{x} = 4.8$, $s_1^2 = 8.64$, $\bar{y} = 5.6$ and $s_2^2 = 7.88$.

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

   (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.   [2]

   (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.

$Chirps(Y)$	24	21	19	19	19	15	12	11	10	22	18
$Temp(X)$	63	62	60	60	58	58	55	53	52	64	61

   (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

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ANOVA
Model Sum of Squares df Mean Square     F    Sig.
1 Regression 197.650    1     197.650    95.990   .000
      Residual 18.532   9      2.059
        Total    216.182   10
a Dependent Variable: y
b Predictors: (Constant), x
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Coefficients
Model Unstandardized Coefficients Standardized Coefficients t Sig.
            B        Std. Error      Beta
1 (Constant) -48.374                6.714         -7.205   .000
      x        1.118    .114          .956          9.797   .000
a Dependent Variable: y
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(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]

(iii) Estimate the correlation coefficient. [6]

SECTION B (60 marks)

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

B4. (a) Explain the differences between Correlation and regression. [6]

(b) Briefly discuss a situation as a manager when you would apply Hypotheses testing of difference between means. [4]

(c) Why do we need to monitor queues when offering service? [2]

(d) Customers arrive at a single server queueing system in accordance with a Poisson system at rate 10 per hour. If the sever works continuously, the number of customers that can be served in an hour has a Poisson distribution with mean 15. Determine the proportion of time when noone is waiting to be served. [3]

(e) In inventory control what is the meaning of the following:

(i) Setup cost, [1]

(ii) holding cost, [1]

(iii) optimum order quantity. [1]

(iv) Consider an item that is used at the rate of 5 units per day. The holding cost per day is $1. The set up cost is $10. The unit purchase price is $c_1 = \$2$. If shortages are not allowed, Determine the optimal order quantity. [3]

B5. A factory manufactures Xs and Ys. Production times(hrs), Capacity(hrs) and profits ($s) are as follows:

	X	Y	Capacity
Dept A	8	10	11000
Dept B	4	10	9000
Dept C	12	6	12000
Profit	$4	$8	

(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) maximax, [2]

    (ii) minimax, [2]

    (iii) maximum likelihood criterion. [2]

    (iv) expected value criterion. [2]

(b) (i) Suppose that you want to invest $10,000 in the stock market by buying shares in one of two companies: A and B. Shares in Company A, though risky, could yield a 50% return on investment during the next year. If the stock market conditions are not favorable (i.e., "bear" market), the stock may lose 20% of its value. Company B provides safe investments with 15% return in a "bull" market and only 5% in a "bear" market. All the publications you have consulted (and there is always a flood of them at the end of the year!) are predicting a 60% chance for a "bull" market and 40% for a "bear" market. Given the data below:

	1 − year return on $10000 investment	
Decision Alternative	"Bull" market	"Bear" market
Company A	$5000	-$2000
Company B	$1500	$500
Probability of Occurence	0.6	0.4

(a) Use the maximum likelihood criterion to determine the most likely occurrence. [2]

(b) Obtain the expected value of money (EMV) and the expected opportunity loss(EOL). [4]

(c) Construct a decision tree and determine where you should invest your money. [5]

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 an Assignment problem. [6]

END OF EXAMINATION PAPER.