



UNIVERSITY OF MINES AND TECHNOLOGY, TARKWA

FIRST SEMESTER EXAMINATIONS, NOV/DEC 2018

COURSE NO: MA 381

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COURSE NAME: STATISTICAL MODELLING

CLASS: MA III

TIME: 3 HOURS

Name: _____ Index Number: _____

ANSWER ALL QUESTIONS.

All Questions Carry Equal Marks

- Q1.** (a). State and explain two probabilistic sampling methods
- (b). Describe how you will select 5 people from a population of 30 people to form committee using systematic random sampling method.
- (c) A production company obtains its parts from three different companies. 25% from company W, 35% from company X and 40% from company Y. Deep investigation has revealed that 3% of the Ws, 2% of Xs and 5% of Ys always have problems. A part is shipped to the production company. Find the probability that the part has a problem. If the part has a problem, what is the probability it was from company X?

- Q2.** (a). Explain the term multivariate analysis
- (b). A local government research unit is looking at the methods that councils use to collect rent from tenants living in houses and flats. In particular, it wants to know whether the relatively expensive door-to-door collection method is effective. A random sample of seven local councils is selected and for each council the percentage of rent collected door-to-door and the percentage of total rent which is in arrears is recorded. The results are shown below:

% of rent collected door-to-door(Y)	10	25	15	13	40	67	55
% of rent in arrears (X)	2	3	6	4	5	7	2

If the dependent and the independent variables are 7×1 and 7×2 nonsingular matrices and $\hat{\alpha}$ is the ordinary least square estimate from the regression of Y on X, determine using the matrix concept:

- $\hat{\alpha}$
- the regression model that fit the data using $\hat{\alpha}$
- the vector of the predicted values

Q3. (a). Explain the difference between parametric test and non-parametric test

(b). The effectiveness of advertising for two rival products X and Y was compared. Market research at a local shopping centre was carried out with participants being shown adverts for two rival brands of coffee, which they then rated on overall likelihood of buying the product. Half of the participants gave ratings for one of the product, the other half gave ratings for the other product. The results are shown in the table below:

Brand X		Brand Y	
Participants	Rating	Participant	Rating
1	3	1	9
2	4	2	7
3	2	3	5
4	6	4	10
5	2	5	6
6	5	6	8

i. Using Mann-Whitney U test, is it reasonable at 1% significance level to conclude that there is a difference between the ratings given to the brand?

(c). A company purchases electronic components in batches of 100 and the supplier guarantees that there will be no more than 5 defective components in each batch. Before acceptance of a particular batch the company has a particular policy of selecting without replacement two components for testing. If both components are satisfactory the batch is accepted and if both are defective the batch is rejected. However, if only one is defective another component is selected and if this is satisfactory the batch is accepted, while if it is defective, the batch is rejected. If the probability that a component is defective is 5%, what is the probability that the batch will be accepted?

Examiner: L. Brew