



# UNIVERSITY OF MINES AND TECHNOLOGY, TARKWA

FIRST SEMESTER EXAMINATIONS, NOV/DEC 2018

COURSE NO: MA 477 [Unihubgh.com](http://Unihubgh.com)

COURSE NAME: TIME SERIES AND FORECASTING I

CLASS: MA IV

TIME: 3 HOURS

Name: \_\_\_\_\_ Index Number: \_\_\_\_\_

**ANSWER ALL QUESTIONS. ALL QUESTIONS CARRY EQUAL MARKS**

**Q1.** (a) State one major weakness of additive model in time series

(b) One of the company's decisions is to purchase a new machine worth GHc 15million that would help to reduce labour requirement. It was established that the machine will contribute GHc 1.4million per annum to profits for 6 years after which it will have to be scrapped for GHc 200,000. Since the company regarded these savings as certain, the appropriate discount rate was 8%, the rate of interest at that time of government bonds. Determine if the machine is worth purchasing by the company. Assume that all inflows occur at the end of the year.

(c). A dress buyer for a large department store must place orders with a dress manufacturer one year before the dresses are needed. One decision is the number of knee-length dresses to stock. The ultimate gain to the department store depends both on this decision and on the fashion prevailing one year later. The buyer's estimates of the gain (in thousands of cedis) are given in the table below.

	Knee lengths are high $P(S_1) = 0.25$	Knee lengths are acceptable $P(S_2) = 0.40$	Knee lengths are not acceptable $P(S_3) = 0.35$
D: Order none	-45	-28	-10
C: Order little	30	-20	43
E: Order moderately	-50	56	55
F: Order a lot	76	67	-10

Determine the recommended decision under:

- i. Maximax decision criteria
- ii. Minimax regret decision criteria

(d) You have a piece of good farmland where you think there may be diamonds. You have to decide whether to farm there or start mining. If you decide to farm you can either plant cocoa for export, or you can grow various produce for own use and selling locally. If you want to dig for diamonds you can either get a geologist in to test for diamonds, or just start digging. The probability of a good outcome with deciding on diamonds and getting a geologist, is 0.25. The value of this outcome is GHC1,000,000 and the value of a poor outcome is GHC40,000. The cost involved with a geologist is GHC200,000. The value of a positive outcome without a geologist is also GHC1, 000,000 and the probability of a good outcome is 0.05. The value of a poor outcome is GHC20,000. With cocoa the costs is GHC300, 000 and the probability of success is estimated at 0.6. The value of success here is GHC600, 000. The value of no success here is GHC20, 000. With various produce the cost is GHC40, 000 and the probability of success is 0.9 with a final value of GHC600, 000. The value of an unsuccessful outcome is GHC30, 000. Use a decision tree to analyse the situation. Write up your final decision and justify the course of action you will take.

**Q2.** (a) Explain the components of a time series

(b) The manager of the electrical company department at a high street store has decided to use statistical forecasting to get better handle on the demand of his washing machines. Quarterly sales of washing machines over the past five years are shown in the table below:

Year	Q1	Q2	Q3	Q4
2001	23	56	23	73
2002	16	70	43	21
2003	49	31	82	13
2004	67	49	10	57
2005	80	55	40	38

The manager decided to use exponential smoothing method to forecast future sale of washing machines, but needs to decide on which smoothing constant to use. He assumes that the forecast of sales of washing machine in first quarter was 22; using  $\alpha = 0.4$  and  $\alpha = 0.7$ , calculate the forecast values from 2001 to the first quarter of 2006.

(c) Prepare a four-period moving average forecast for the first quarter of 2006 of the data and calculate the Mean Absolute Deviation (MAD) of the four-period moving average,  $\alpha = 0.4$  and  $\alpha = 0.7$ .

(d) Which of the three forecasts is the best?

**Q3.** (a) The number of daily visitors to restaurant is shown below. Calculate the 3-period moving average forecast for the data

Day	1	2	3	4	5	6	7	8	9	10	11
Visitors	34	12	70	15	60	35	10	66	71	80	40

(b) The personnel department of CALYPO, a large food processing company, is concerned about absenteeism among its shop floor workforce. There is a general feeling that the underlying trend has been rising, but nobody has yet analysed the figures. The total number of shop floor employees has remained virtually unchanged over the last few years. The mean number of absentees per day is given in the table below for each quarter of years from 2001 to 2005

Year	Q1	Q2	Q3	Q4
2001	77	67	93	76
2002	90	44	61	66
2003	70	51	82	43
2004	87	79	10	57
2005	55	29	90	65

(c). Determine the seasonal indexes for the absentees using ratio –to-moving average method

(d). Deseasonalise the data

***Examiner: L. Brew***