THIRD YEAR **SECOND** SEMESTER EXAMINATION FOR DEGREE OF BACHELOR OF SCIENCE IN ACTUARIAL SCIENCE

ACMT 312 – LINEAR MODELS AND FORECASTING

DURATION: 2 HOURS

DATE:

TIME:

Instructions to Candidates:

1. Answer **Question 1** and **Any Other Two** questions.
2. Mobile phones are not allowed in the examination room.
3. You are not allowed to write on this examination question paper.

SECTION A – ANSWER ALL QUESTIONS IN THIS SECTION

QUESTION ONE

a) Briefly explain what is causal forecasting? (2marks)

b) Outline four uses/importance of Regression models? (6 marks)

c) The Sales manager using a combination of methods has forecast sales of toasters at a local department store. Calculate the MAD for the manager's forecast. Compare the manager's forecast against a naïve forecast. By how many units on average does manager's forecast differ from a naïve forecast? (5 marks)

Month	**Unit sales**	**Managers forecast**
January	52	
February	61	
March	73	
April	79	
May	66	
June	51	
July	47	50
August	44	55
September	30	52
October	55	42
November	74	60
December	125	75

d) What is the difference between qualitative and quantitative forecasting? Give two examples for each method (4marks)

e) What does the abbreviation **MAPE** stand for? Briefly explain what it is. (3 marks)

f) List the process plan for improving forecast accuracy using artificial intelligence support systems(10 marks)

SECTION B – ANSWER ANY TWO QUESTIONS IN THIS SECTION

QUESTION TWO

a) What is the forecast for May based on the weighted moving average applied to the following past demand data and using the weights: 4,3,2 (largest weight is for the most recent data)? (3 marks)

Nov	Dec	Jan	Feb	March	April
37	36	40	42	47	43

b) Forecast the demand for seventh period using the exponential smoothing method using $\alpha = 0.3$ and $\alpha = 0.7$ and find the absolute errors for each period.(8 marks)

Period	Actual Demand
1	2700
2	2950
3	2660
4	2980
5	3010
6	3140

c)Comment on the difference between the answers above using the two values of $\alpha = 0.3$ and $\alpha = 0.7$(3 marks)

d)Explain how forecasting can be useful in three different fields (6 marks)

QUESTION THREE

a)What is technological singularity (2 marks)

b)Outline three general scenarios where judgmental forecasting is most appropriate (3 marks)

c)Chuka University runs a chain of movie theaters in Tharaka Nithi County and has enjoyed success with a Wednesday night at the movies promotion. By offering half of its regular Kshs. 9 admission price, average nightly attendance has risen from 500 to 1500 persons. Popcorn and other snacks revenues tied to attendance has also risen dramatically. Historically, the University has found that 50% of all moviegoers buy a Kshs.5 cup of buttered popcorn.Eighty percent of these popcorn buyers, plus 40% of the moviegoers that do not buy popcorn ,each spend on average Kshs.4 on soda and other snacks.

i) Write an expression describing total revenue from tickets plus popcorns plus other snacks? (5 mark)

ii) Forecast total revenues for both regular and Special Wednesday night pricing. (5 marks)

iii) Forecast the total profit contribution earned for the regular and special Wednesday night pricing strategies if the contribution is 30% on movie ticket revenues and 80% on popcorn and all other snacks revenues (5 marks)

QUESTION FOUR

a)Outline 3 limitations of forecasting.(3 marks)

b) Calculate the seasonal indices for the quarters based on the following data(11 marks)

Year	1st quarter	2nd quarter	3rd quarter	4th quarter
2004	3.7	4.1	3.3	3.5
2005	3.7	3.9	3.6	3.6
2006	4.0	4.1	3.3	3.1
2007	3.3	4.4	4.0	4.0

c)Discuss Three of the more commonly used AI systems in forecasting (6 marks)

QUESTION FIVE

a)Explain the Classical decomposition of a Time series/ components of a Time series(8 marks)

b) Forecast the sales for the 13, 14, 15 and 16th quarters for the data given below using the least squares method. (12 marks)

Quarter	*Sales*	*Quarter*	*Sales*
1	600	7	2600
2	1550	8	2900
3	1500	9	3800
4	1500	10	4500
5	2400	11	4000
6	3100	12	4900