



JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY
SCHOOL OF HUMANITIES AND SOCIAL SCIENCE
UNIVERSITY EXAMINATION FOR THE DEGREE OF BACHELOR OF ARTS IN
DEVELOPMENT AND POLICY STUDIES

2ND YEAR 1ST SEMESTER 2017 APRIL EXAMS

MAIN CAMPUS (REGULAR)

COURSE CODE: ZDS 3213
COURSE TITLE: QUANTITATIVE METHODS II

EXAM VENUE: **STREAM: BA ARTS**

DATE: **EXAM SESSION:**

TIME: 2 HOURS

Instructions:

- 1. Answer Question ONE (COMPULSORY) and ANY other 2 questions**
- 2. Candidates are advised not to write on the question paper.**
- 3. Candidates must hand in their answer booklets to the invigilator while in the examination room.**

Question One (30 Marks)

- a) A manufacturer buys costing equipment from outside suppliers at Ksh 3000 per unit. Total annual needs are 800 units. The following data is available:
 Annual Return on Investment 10%
 Rent, Insurance etc. per unit per year Ksh 100
 Cost of Placing an order Ksh10000
 Determine Economic Order Quantity. [6 marks]

- b) A company manufactures two products X and Y using three machines A, B and C. The machines A, B and C are available for 4 hours, 24 hours and 35 hours respectively during the week. Producing a unit of X requires 1 hour on machine A, 3 hours on machine B and 10 hours on machine C. Similarly producing a unit of Y requires 1 hour, 8 hours and 7 hours on machines A, B and C respectively. Product X is sold at the market at a profit of 35 shillings per product and Y is sold at a profit of 49 shillings per product. Formulate the L.P for the problem. [3 marks]

- c) Solve the following Linear Programming problem;

$$\begin{aligned} \text{Minimize } Z &= -2x_1 - 3x_2 \\ \text{s/t} \\ x_1 + x_2 &\leq 2 \\ 4x_1 + 6x_2 &\leq 9 \\ x_1, x_2 &\geq 0 \end{aligned} \quad [6 \text{ marks}]$$

- d) The Table below presents voter reactions to a new property tax plan according to party affiliation. From these data, construct a table of the expected frequencies based on the assumption that there is no relationship between party affiliation and reaction to the tax plan.

Party affiliation	Reaction			Total
	In favour	Neutral	Opposed	
AMANI	120	20	20	160
SAFINA	50	30	60	140
FORD	50	10	40	100
Total	220	60	120	400

Test the null hypothesis that there is no relationship between party affiliation and voter reaction. Take $\alpha = 0.01$ [8 marks]

- e) The demand and price (in Ksh '000') for a bag of a hybrid 100 kg bag of wheat in different regions of the country are as shown below;

Price (in Ksh '000')	7	9	8	11	13	12
Demand	24	28	25	30	31	30

Calculate the Karl Pearson's correlation coefficient and comment on the value

[7 marks]

Question Two (20 Marks)

- (a) The payoffs (in US \$) of three Acts A1, A2 and A3 and the possible states of nature S1, S2 and S3 are given below

States of Nature	Acts		
	A1	A2	A3
S1	-20	-50	200
S2	200	-100	-50
S3	400	600	300

The probabilities of the states of nature are 0.3, 0.4 and 0.3 respectively. Determine the optimal act using the Bayesian Criterion.

[7 marks]

- (b) A manufacturer of Drilling bits must determine whether or not to expand his productive capacity. His profit per month, however, depend upon the potential demand for his product which may turn out to be high or low. His payoff matrix is given below

	Do not Expand	Expand
High Demand	\$ 5,000	\$7,500
Low demand	\$5,000	\$2,100

On the basis of past experience, he has estimated the probability that demand for his product being high in future is only 0.4. Before taking a decision, he also conducts a market survey. From the past experience he knows that when the demand has been high, such a survey had predicted it correctly only 60% of the times and when the demand has been low, the survey predicted it correctly only 80% of the times. If the current survey predicts that the demand of his product is going to be high in future, determine whether the manufacturer should increase his production capacity or not?

[13 marks]

Question Three (20 Marks)

The Table below gives the activities in construction project and time duration.

Activity	Preceding Activity	Normal time (days)
1-2	-	20
1-3	-	25

2-3	1-2	10
2-4	1-2	12
3-4	1-3,2-3	5
4-5	2-4,3-4	10

(i) Draw the activity network of the project.

[7 marks]

(ii) Find the total cost and free cost for each activity.

[13 marks]

Question Four (20 Marks)

Consider the following time series data for sales in ten months.

Period	1	2	3	4	5	6	7	8	9	10
Sales	10	12	9	10	11	20	19	23	20	21

Compute the 3 period moving averages and exponential smoothing values for the time series using $\alpha = 0.5$ for the time series. Find the respective forecast for the eleventh period. which one of the above technique provides the most accurate forecast for the time series? (use MSE)

[20 marks]

Question Five (20 Marks)

Suppose Naivas supermarket has just leased a new store in Kisumu and is attempting to determine where various departments should be located within the store. The store manager has 4 locations that have not yet been assigned a department and is considering 5 departments that might occupy the 4 locations. The departments under consideration are SHOES, TOYS, AUTO PARTS, HOUSEWARES and VIDEOS. After a careful study of the layout of the store, the manager has made an estimate of the expected annual profit (ksh 1000s) for each department in each location as follows,

Dept	Location			
	1	2	3	4
Shoe	10	6	12	8
Toys	15	18	5	11
Auto parts	17	10	13	16
Housewares	14	12	13	10
Video	14	16	6	12

Required:

(i) optimal allocation for each department

[15 marks]

(ii) the total annual profit expected.

[5 marks]