

**POPULATION ESTIMATION USING GEO-INFORMATICS WITH
DIGITAL INSTRUMENT**

A CASE STUDY OF KURMIN MASHI AREA.

BY

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DECLARATION

I, Rauph Olasunkanmi Adebisi, hereby declare that this project titled 'Population Estimation Using Geo – Informatics with Digital Instrument' was carried by me unaided under the supervision of Dr Yomi Aiyesimi of the Department of Mathematics and Computer Science, Federal University of Technology, Minna.

Rauph O. Adebisi

.....
Rauph O. Adebisi
Declarant.

10/12/03

.....
Date

CERTIFICATION

This is to certify that this project is the original work undertaken by Rauph Olasunkanmi Adebisi. [PGD/MCS/2001/2002/1094] under the supervision of Dr Yomi Aiyesimi. It has been prepared in accordance with the regulations governing the preparation of project in the Department of Mathematics and Computer Science and the School of Post Graduate Studies, Federal University of Technology, Minna. The project has been read and approved by ;-

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Dr. Yomi Aiyesimi
Supervisor

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Date

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Mr L.N. Ezeako
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Dean Post Graduate School

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Date

DEDICATION

I dedicate this project first and foremost to Almighty God; He made what looks an impossibility; 'Possible'. And to the memory of my late brothers and sister. Abdul Moshood Adebisi; Mrs. Riskatu Abdul – Salam [Nee Adebisi]; Alhaji Teslim Adebisi. May God in his mercy rest your gentle souls in the garden of Al-Jannah.

ACKNOWLEDGEMENT

It has always been my desire to undertake a postgraduate programme in Computer Science since 1997, but a wish that has remained a dream.

This dream was however, realized in 2001, to God be the glory for keeping me alive and in good health.

Dr Yomi Aiyesimi has been wonderful in the supervision of this project and the write – up, thanks for the relentless effort spent going through every written line and valuable advice.

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My very dear friends, Mr. James Olayemi, the made sure accommodation was never a nightmare, and Mr. Rasaq Olarinde for cheering me up, so that I am never lonely.

My family are not left out, my wife Detola; and our children, Bilkis; Rafiat; Mugniyu; Abdul – Malik; Riskat and Faridat. They have all suffered one form of deprivation during my frequent absence. Their sacrifice enabled me to achieve this noble objective.

To others too numerous to mention, may God in His mercy reward all of you abundantly.

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Chapter One

ABSTRACT.

Geo-informatics can be very useful for estimating population in fast growing newly build-up area of any third world cities. Reliable result can be achieved with the aid of an interface digital instrument to a photogrammetric stereoplotter. This enables digitization of all buildings or erected structures of habitable nature. Samples are then taken and from data acquired from a previous census, estimates can be derived. This method has proved to be faster than the conventional head-to-head count; it is cost effective, since manpower requirement is less. The use of digital instrument and appropriate computer softwares and techniques adds the convenience of this method.

1.0 INTRODUCTION:

Population census in Nigeria has been a controversial issue from the first census conducted in 1911, ten years after the amalgamation of both south and northern protectorates. All other subsequent census conduct were greeted with the same skepticism, these includes those of 1921; 1931 & 1952/3.

The attainment of independence in 1960, and the population census that followed it in 1963/64 was marred by bitter disapproval of the resulting estimates, a controversy that almost tore our fragile unity into shreds. The question one may then ask is. Why are these controversies over census estimates so endemic in Nigeria? The answer according to Ahmadu Kurfi, "the linkage of population figures, to parliamentary representations and provision of social amenities to communities are perhaps the main cause of the controversy". He did not stop there, but further postulates that, "each region, each ethnic group within a region, and each community or clan within any administrative unit, whether village or town, endeavors to maintain a strong position Vis-à-vis its compeers during each census, and any result that disrupts this equilibrium will be challenge by those that become disadvantage " (2)

Also, the creation of states and local government areas councils, thus, turning most of our erstwhile towns or villages into state capitals or council headquarters'; this have led to serious population drift, from the rural area to these newly created capitals and headquarters', for white collar jobs.

It is also desired that in arriving at a credible estimate, certain analysis have to be made on the various components of popuiation estimates and changes, in

other to draw reasonable conclusion and take appropriate decisions. Some of these components may include the followings among others, birth or fertility rate; mortality; and migration (both immigration and emigration)

Therefore, the problem of population estimate has attracted the attention of photogrammetrist over the years, thus necessitating the need to seek alternative to physical enumeration or house-to-house head count. Therefore, the need for geo-informatics' approach is growing concurrently with an increase awareness of the dynamism of population growth. Aerial photograph therefore, serves as the most efficient and viable tool, for identifying; mapping and measuring of urban growth. "This as been found to be 100% faster than the traditional ground survey methods and the reliability of acquired data can easily be verified" (14) only that, the information about the inhabitants may not be derived directly from these photographs; other means have to be used to get these other information.

Therefore, population estimation base on the interpretation of aerial photographic images, of any chosen area, using "residential homogeneity with respect to population densities." (14) Considering the above, an analysis can be made, using available statistical analysis tool and computer software.

Analyzing the derived data, while considering the deferent components used in arriving at a preliminary estimate, requires, the application of some statistical inferences, this will enable the setting of a confidence level between the derived estimate and the actual census values; thereby providing the basis for future projection.

The use of computer facilitates the different statistical tests, the sampled survey data and derived population estimates were subjected to. Using the time series Analysis and regression model for analyzing the data collected, as enhanced the proficiency of observed data. Describing and controlling of data, based on the study of trends over time and thereby making predictions that are appropriate, for future projections; which is the central thrust of this project. The above were achieved, believing that with the appropriate computer software, the speed, accuracy, reliability and the high storage capacity of the computer will enhance the diligence of result.

Therefore, the visual basic version 5.0 was used in developing the programs for the project. Being a window based application software, as well as

the speed, accuracy, reliability and the high storage capacity of the computer will enhance the diligence of result.

Therefore, the visual basic version 5.0 was used in developing the programs for the project. Being a window based application software, as well as an object oriented programming language. The choice of Visual Basic 5.0 is because of the following derivable benefits:-

- (i) It provides the user with a font end or user interface where entries can be made and out-puts viewed through forms & reports.
- (ii) It involves the programming of processes that enables users to automate any activity.
- (iii) It enable connection to any relational data base system such as Microsoft Access (Mdb); D Base (Dbf); paradox; Oracle and e.t.c, through its open database connection capability (ODBC).

1.1 BRIEF ON KURMIN MASHI

Kaduna town is the capital of Kaduna State of Nigeria, but has nonetheless been the sit of government from time immemorial.

Kurmin Mashi is a sub-urban area within Kaduna Township, and located within the Kaduna South Local Government Area. It is one of the ten suburban areas that form the local government area.

It is bounded to the north by 81 Army Barracks and the Government College Kaduna to the south. The Western Bye pass, bounds it to the west and the Nigerian Defense Academy to the east.

The inhabitants are an admixture of the diverse cultures of Nigeria federation. Their social class ranges between petty traders; subsistence farmers; middle class and until recently some elite class. Majorities of the working class, works either, as civil servants; Company employed; or self employed.

The traditional settlement, is not planned / layout. But the extension areas are planned layout with good access roads. The buildings are an admixture of nucleus family compound type; the room and

Par lour type or two / three bedrooms flats with some rooms and par lour in the same compound

1.2 PURPOSE AND BACKGROUND OF THE STUDY.

Census result in Nigeria, as stated earlier have always been a controversial issue. This research therefore is targeted toward using sample survey carried out for small a village, and sub-urban areas in our different cities and towns across the country, using Geo-Informatics with area photography as the tool for data gathering.

As we all know that, human population is both the agent and beneficiary of planning efforts, derived from population census. Therefore the aim and objectives of the research project are:-

- (i) To use aerial photographs to acquire reliable data, about the population of any area.
- (ii) To draw analysis on acquired and existing data using the different determinant factors such as fertility rate, mortality rate, Migrations and economic development, to see the effect on population
- (iii) To determine population based on the factors stated above and be able to forecast or project population for any specified period years.
- (iv) To develop an application package that will enable the user to achieve the above stated objective.

1.2.1 RESEARCH QUESTIONNAIRE

The questionnaire is tailored to achieve the set objectives, without necessarily bothering the respondent about the irrelevant. Bearing the fact that the enumeration unit, for the sample survey after the pilot study, shows that the inhabitants are mostly available in the evenings, and on Sundays. Bearing these factors, the designed questionnaire is made simple and explicit as shown below.

1.3 SCOPE & SIGNIFICANCE OF THE PROJECT:

The scope of the project will be limited to using the aerial photographic coverage of part of Kaduna Township, Kurmin Mashi (the enumerating unit) inclusive; for the sample survey on population estimation. The result from this survey can then be use as a basis for a larger sample of population and projection / forecast for future growth.

The significance therefore, bearing in mind the various ways, record can be used; in a variety of national; corporate; administrative planning and researches, cannot be over emphasized. These facts prompted the federal government to promulgate the decree No. 23 of 1989 establishing the National population's Commission. An organization saddled with the responsibility of obtaining information on the socio-demographic characteristics of the Nigerian populace to facilitate socio-economic development planning. This type of project will not only assist such body; government at various levels; and other interest groups, in the studying of the trends in population change.

Whereas the program is designed, to assist in the analysis of some samples, for quick planning purposes, as well as being able to adapt it, to meet the information needs of government. Its therefore, the researcher believe that this will serve as an index for various bodies, that is interested in population studies and policy makers as well. The original data used for this project makes as well. The original data used for these projects refers strictly only to 1991 national population census record.

1.4 PROBLEMS AND PROSPECTS OF POPULATION CENSUS

1.4.1 Problems associated with population census in Nigeria.

A number of problems have continued to plague population sub-sector of our nation, especially in the area of census figures. According to National Population Commissions publication (12) titled "1991 census questions and answer," it was revealed that the failure of the past census in Nigeria can be attributed to a number of factors among which are:

- a) Inadequate time for planning and execution.
- b) Lack of national framework for proper demarcation and identification of enumeration area

- c) Inadequate experienced professional in census operations.
- d) Ineffective supervision of field activities.
- e) Logistic problems of Inaccessibility to certain parts of the country and communications difficulties.
- f) Inappropriate national population census policies and failure to set up a national population data bank.

Another big problem which does attends our census efforts is the incomplete response, which do arisen as a result of lack of interest shown by some members of the population. As observed by Professor Jibril Aminu, (10), in a key note address at the African Regional Training Seminar on a topic titled, "population education" asserted that; ".....Nigeria's population is at present estimated to be about 112million, with a growth rate of 3.3% per annum. By the year 2015, Nigeria's population is projected to reach about 240 million at this growth rate....."

He then concluded and recommended practical solutions such as, developing appropriate mechanism for disseminating available demographic data to policy makers.

1.4.2 PROSPECT OF POPULATION CENSUS.

In order to raise the quality of life of Nigerian, in spite of all these problems, there is the prospect, that population census, can bring many gains. Some of these prospects may include the followings: -

- 1) Allowances for better plans towards the elimination of hunger, unemployment inflation, and low standard of education e.t.c.
- ii) Overall better living conditions and improved social services.
- iii) Establishment and maintenance of machinery for continuous and universal registration of births and deaths through out the federation.
- iv) Provision for collation and publication of data on migration statistics.

There are many other advantages.

In a publication by the Ministry of Finance and Economic Planning, Kaduna State [8] titled, "Kaduna State of Nigeria-Population Census of 1963 and Projections from 1984-1990." reveals that "...the population is characterized by very many young people and about 46% of the inhabitants of

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Chapter Two

2.0 LITERATURE REVIEW.

The need for literature reviews is to familiarize the researcher with the efforts of other pioneers in their research efforts towards efficient population estimation. And also to understand their method of research, so that, this researcher don't repeat same. Further more their findings and conclusion will be a source of tremendous inspiration for this research effort.

Therefore many researchers have published books, journal and conference papers on population census, ranging from data acquisition of data to statistical analysis; evaluation and adjustment information system.

2.1 REVIEW OF DATA ACQUESITION USING AERIAL PHOTOGRAPHS.

There are various methods that population data may be acquired, but this section, will only preview relevant Geo-informatics method, using aerial photography as a source data as attempted by other scholars.

One of such scholars is Kraus. S. P [3] in his joint effort with other scholars on "Estimating population from photographically determined residential land uses types" came to believe that population estimation based on aerial photographic interpretation using residential classification systems is approximately 50 times faster that a conventional census, [head to head count].

He further started that in subsequent study in Senegal on the subject of homogeneity of residential classes Kraus (3) "our result indicate however, that 20 percent is a better estimate and that in a considerable number of cases higher values will be found."

Also, Sujarto D. (4) stated in his paper on "land use-land tenure and land development; integrated approach for improvement of marginal settlement at Cikutra and Babakan Surabaya Katamadya Bandung" that, on the basis of the size of the population (from population registration), the size of the administrative units and land use break downs (based on aerial photos and fieldworks), it is possible to compute net residential population densities; averages and standard deviations.

D'Allaux; Einselle and Karpe. (5) in the preliminary report on the "Metropolitan Lagos, Water Supply & Demand Analysis" observed that, a system for estimating the population of parts of Lagos using four classes of residential areas (R1 to R4), and establishing the typical class population density for each area, based on population counts in sample areas.

Also, Victor F.L. Polle (2) in his paper "Population Estimation from Aerial Photos for Non-Homogeneous Urban Residential Areas." Observed that, comparison of aerial photographs of different years is an efficient tool, for identifying mapping and measuring new urban areas.

He further observed that, "residential classification systems which take into account both density and standard of housing." Therefore, housing can be classified according to phenomena visible on aerial photographs, including plot size, and house area, number of storey e.t.c. On the other hand Adeniyi (6) in his paper "an aerial photographic method for estimating urban population" found that, occupancy rate contribute between 3 and 37 percent of the variation in population density in different residential classes.

2.2 REVIEW OF STATISTICAL METHODS AND TOOLS.

Ahmed Auwal. (7) In his works, "National Population Information System (computerized census and vital events Analyses)," ended up not achieving the desired result. Although he made us to understand that with the computer, population census data can be effectively analyzed if well programmed; his research was limited to population census record keeping. Also there were no provision to know the procedure and computations of periodic population projections. He therefore, neglected to analyze data on vital events regression and migration.

Another research, Suleiman Mohammed, (8) writing on "computerized Demographic Record Analysis", observed what in primary health care system, using demographic data for analysis, the chi-square Distribution Method was used, been a statistical tool used to test if there is any significant difference in reported cases of different diseases. He further analyzed data on fertility and mortality and estimates their relationship with some killer diseases. He finally concluded that there are no significant differences in the reported cases of the different disease under review and Neo-Natal mortality in the years

under review. Gada Sahabi, (9), conducted a research on, "Evaluation, Adjustment and Projection of Nigerian population" Based on 1963 census count. "In his attempt to analyses the population census data on ground", Gada ended up with a series of analyses difficult to understand. The fact that his analysis were not computer based, made his finding limited and skeptical.

Richard Runyon (10), in is book titled "Descriptive Statistic", defined statistical method in measures of central tendency as "quantities that reflect numerical values in the central region of a distribution of scores." He further explained that this statistical method makes use of statistical tools namely: mean; median and mode which are jointly called measures of central tendency. He went further to demonstrate several examples on calculations of the three measures of central tendency, showing the similarity and differences between them.

Another Author. Gareth Jaracek, (11), in his book tilted "time series-forecasting, simulation and application," defined Time Series Analysis as a statistical method which involved the careful examination of series of statistical data recorded over time? He stressed the importance of trend analysis 9a component of time series analysis) in determining steady tendency of population pattern to increase or decrease over a long period of time. Therefore, reflecting long-term growth or decline in population trend, to make long term projection into the future.

He further explains the usefulness of Regression Analysis as a statistical tool for indicating that a straight line through the data would produce a good fit, when time series moves up or down in a regular way. Gareth finally concluded with several illustrations on the use of regression analysis, as a tool, for predicting the values of one variable (the dependent variable), corresponding to a given value of another variable (the independent variable).

2.3 REVIEW OF THE EFFORTS TO IMPROVE CENSUS EXERCISE:-

In view of the problems encountered previously, various bodies have being making effort to right the wrongs, thereby improving upon the standards of population censuses in the country.

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In view of the problems encountered previously, various bodies have been making effort to right the wrongs, thereby improving upon the standards of population censuses in the country.

Two of these bodies will be previewed. They are:-

- A] The Federal Government.
- b) The National Population Commission.

2.3.1 FEDERAL GOVERNMENT EFFORTS:-

- 1) The establishment of National Population Commission, by the promulgation of decree No. 23 of 1989, to provide the necessary and reliable data, on a continuous basis for the essential development planning.
- 2) The inclusion of a penalty clause for falsification of census returns.
- 3) Making population education mandatory in all teachers training colleges and other institutions of higher learning.
- 4) Providing financial support to sustain population projects.
- 5) Improvement of rural economics and development of social facilities to reduce rural-to urban development of social facilities to reduce rural -to-urban drift.
- 6) Provision of a natural framework for proper demarcation and identification of enumeration areas.
- 7) Integration of a comprehensive rural/urban policy into the over all development planning process, aimed at reducing the current high rate of migration to urban centers.
- 8) Establishment of a coordinating committee on population census information and education such as SPEC and NERDC (State Population Education Committee; and Nigerian Education Research and Development Council) respectively.
- 9] Enactment of laws, to protect, the family and marriage Institution.
- 10] Review of existing health delivery systems and the implementation of primary health care.
- 11) Organizing seminars and workshop for both the general public and the census officials.

2.3.2 NATIONAL POPULATION COMMISSIONS EFFORT

Since the establishment of the National Population Commission, [NPC] which replaced the former National Population Bureau (NPB), these has given an impetus to the on going population activities nation wide. Since its inception, NPC has been engaged in organizing of various activities toward a successful population census. Among which include:

- i) Setting of machinery for continuous national registration of births and deaths throughout the federation.
- ii) Preparation and designing a national framework for the delineation exercise censuses and sample surveys.
- iii) Collection, collation and publication of data on migration statistic.
- iv) Monitoring the national population policy and setting up a national population data bank.
- Vii) Recruitment and training of demarcating supervisors, on basic philosophy of the NPC.
- viii) Demarcation of enumeration areas, to ensure that no community will be left out.
- ix) Embarking on a massive and extensive public enlightenment campaign to reach all corners of the country, thereby educating the population of the importance census.
- x) Undertaking of their pre-census activities, including the design census questionnaire and organizing of trial census.

Chapter Three

3.0 SYSTEM ANALYSIS AND DESIGN

Word methodology can be said to be set of standardized procedures, including technical methods management techniques, and documentation, that provides the framework for the accomplishment of a particular function. This chapter will detailed the methods of data collection employed, including the reliability and validity of their sources. The population and area of study as defined, and the statistical tools used will be given. The procedures for data and analysis will be discussed; and in addition, the computer configuration, file input, output, and system specifications will be given.

3.1 METHODOLOGY for DATA ACQUISITION & ANALYSIS.

3.1.1 METHOD OF DATA COLLECTION

Data collection methods involves the uncovering of the informations necessary in solving a stated problem, in this case, using aerial photograph of Kurmin Mashi area to estimate and project the population size of the area. In doing this, three methods were adopted, documentary; interviews (oral) and questionnaire (open end).

The documentary method include the gathering from secondary sources, which includes journals; conference papers; project reports; previous population records from the National Population Commission and Aerial Photographs.

Interviews conducted entails eliciting information from the respondents through series of verbal and social interactions. Whereas, the open end questionnaire used, asked only questions pertinent to the objectives of this project.

The following steps were taken:-

- (i) Aerial photographs were scanned stereoscopically to identify homogeneous residential areas.
- (ii) Boundaries of census zones were transferred on to the aerial photographs.
- (iii) The number of houses identifiable for each census zone was extracted from the aerial photograph.

{iv} Sample houses were then chosen at about 10% rate of the total number of houses in each of the five zones.

{v} Population samples survey was conducted physically to ascertain the population size per house. {Note: 'a house' is defined as a building with a courtyard and one entrance.}

VI The population density (Person/Zone) and the occupancy rate (Persons / House) were computed for the sampled area; in each sampled zone,

Vii the average population density and the standard deviation; the average occupancy rate and standard deviation were computed.

3.2 PROCEDURES OF DATA ANALYSIS.

The methods adopted for data analysis are both descriptive and inferential. The descriptive aspect includes tabular representations; graphical presentations; regression analysis and time series analysis. Whereas the inferential analysis involved, the use of small sample data, to infer or reach a general conclusion about a much larger population.

This is an organization scheme, which provides for economy of presentation. It involves the use of tables. Tables' usually have four elements, viz: a caption, column labels, row labels and cells. The caption describes the information contained in the table; the column labels identify the information in the columns, while the row label identifies the information in the rows. A cell is defined by the intersection of a specific row and a specific column. In essence, a table is a sequential representation of facts or figures in rows and columns where each row represents a record and column corresponds to the fields.

3.2.1 GRAPHICAL PRESENTATION.

This is another presentation technique, enabling the presentation of quantitative data in more accessible and visual way. For the purpose of presentation in this project, graphic (scattered diagrams) and charts were used. This has enabled rough estimates of unknown parameters to be made.

3.2.2 REGRESSION ANALYSIS:

This method of analysis enables the utilization of the relationship between two or more quantitative variables, such that, one variable can be used to predict the others however; multiple regression analysis is adopted, since more than one variables were involved in this analysis. This is a method for determining the relationship between a dependent variable and more than one dependent variables. The general linear regression model is shown below.

$$Y_i = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \dots + \beta_{p-1} X_{n . P-1} .$$

Where: - Y_i is the dependent variable.

$\beta_0, \beta_1, \beta_2, \beta_{p-1}$ are the unknown parameters.

$X_{1i}, X_{2i}, \dots, X_{n . P-1}$ are known variables

1, 2----n are the number of observation.

3.2.3 TIME SERIES ANALYSIS:

The data slated for analysis exhibits the tendencies either to grow or decrease fairly steadily over time. It is therefore appropriate to use a technique that analyses a statistical series or set of data from a quantifiable (or qualitative) event as recorded over a period of time.

However, due to the nature of data collected for this project, interest was directed towards the linear time trend method, as a measure of the trend, and since the time series changed linearly over time. Therefore, the simple linear regression model written below was used to relate the time series, Y_t to time t . and the least squares line was used to forecast the future values of Y_t .

$$Y_t = \beta_0 + \beta_1 t + \dots \text{---eqn ... (1)}$$

However, the estimated simple linear regression model is defined as.

$$Y = a + bx$$

where Y is the dependent variable

X is the independent variable

a - is the Y-intercept [i.e. value of Y when $X = 0$]

b - is the slope [i.e. the amount of change] in Y for a unit change in X

3.2.4 POPULATION VERSUS TIME HYPOTHESIS

In order to give room for broad generalizations, and principles that allows explanation and prediction of event, the population versus time hypothesis was used.

Since the aerial photographs used for this project was taken in 1977 and the population data, from which the initial record were calculated, were those of 1991.

Therefore, the hypothesis that there is no linear relationship between the populations in Kurmin Mashi with respect to the period (time) under consideration is a null hypothesis and will be rejected, if proven wrong. Whereas, the alternative hypothesis, that proves that, there is a relationship between the populations over a period of time will be acceptable when proven.

This hypothesis is stated as follows below:-

H_0 population is not linearly related to time in Kurmin Mashi

i.e. $H_0 : N_{pop} - N_{time} = 0$ or $H_0 : b=0$

H_i population is linearly related to time in Kurmin Mashi

i.e. $H_i : N_{pop} - N_{time} \neq 0$ or $H_i : b \neq 0$

3.3 COMPUTER CONFIGURATION.

This section describes with the physical and non physical 'make up' of the computer that were needed to accomplish the task of developing and writing a well structured program, as well as keying in the texts. Below is a brief description of these requirements. The configuration of the computer system that will effectively execute the programs developed for this project include:-

- a. visual display unit (VDU}
- b. hard disc drive.
- c. floppy disc drive.
- d. system unit (486, Pentium iii)
- e. window base operating system
- f. floppy diskettes for backup of useful information
- g. UPS (600 Volts) for power retention in case of power failure and equipment protection.

3.3.1 HARDWARE'S AND SOFTWARE'S:

a) Hardware's Requirements:

This will include the physical computer itself and other peripheral devices, such as the monitor; system unit; keyboard; printer and other auxiliaries.

b) Software's Requirements:

These refer to the set of instruments that has been developed, tested and documented to accomplish a task or series of tasks. These software's include, the operating system and the language translator.

c) The operating system

The operating system is a manufacturer designed integrated computer programs, which enable the computer to correlate the different aspects of its function with or without minimum of human intervention. Example includes, Ms-Dos; PC-mos; UNIX; LINUX and Windows. However, Windows 98 operating system is the one used for implementation of the programs design for this project.

d) Language Translator

This is a program that translates other programs from their source language into an object equivalent. Example includes Interpreters, Assemblers and Compilers; for this project a visual basic compiler was used since visual basic version 5.00 program was source program.

e) Other Requirements Includes

- i Program installation
- ii Creation of a suitable directory
- iii Copying program from drive A: to drive C :
- iv Open database connection for the program.
- V Creating an executable file for the program, by using Visual Basic Executive Deplorer.
- VI Data and files security measures.

3.3.2 FILE SPECIFICATION

A file is a logically related records, however the files used in this program for this project includes:

- a. Project file:- it contains the list of forms related to the program and enables a user to view objects and codes of associated forms. The project file for this project is named "population Vbp"
- b Database file:- this file is made up of tables use in storing data received from form input, as well as result of processed data in response to coded commands in the program. The database file used for the project is the Microsoft Access file named 'population Mdb' the tables created includes: -

Linear-tab

Matrix-tab

Multi-tab.

C Form files: - these provides an interface inputting, processing and displaying data. The form files that were designed includes:

- i) frm- Menu. frm ii) frm- Linear.frm
- iii) frm Mult. Frm iv) frm – reduce. Frm; other include picture files and report files.

3.3.3 Structure of the Database.

The data-base file is population. Mdb made up of tables stated in 3.3.2b above below are the details of the table structure.

Field Name	Data Type	Field Size	Required	Indexed.
Year	Number	Single	No	No
population	Number	Single	No	No
Popu-mul.	Number	Single	No	No
mid-point	Number	Single	No	No
Mid-point sq	Number	Single	No	No
Mid x popu mil	Number	Single	No	No

2] Matrix - Tab

Field Name	Data Type	Field Size	Required	Indexed.
Col1	Number	Single	No	No
Col2	Number	Single	No	No
Col3	Number	Single	No	No
Col4	Number	Single	No	No
Col5	Number	Single	No	No
Col6	Number	Single	No	No
Sum Col	Number	Single	No	No

Multi Tab

Field Name	Date Type	Field Size	Required	Index
Population (Y)	Number	Single	No	No
Birth X1	"	"	"	"
Death X2	"	"	"	"
Emig X3	"	"	"	"
Img X4	"	"	"	"
Birth Sq	"	"	"	"
Death Sq	"	"	"	"
Emg Sq	"	"	"	"
Imig Sq	"	"	"	"
Year.	"	"	"	"
Y2 (populationSq]	"	"	"	"
X1 X2	"	"	"	"
X1 X3	"	"	"	"
X1 X4	"	"	"	"
X2 X3	"	"	"	"
X3 X4	"	"	"	"
Y X1	"	"	"	"
Y X2	"	"	"	"
Y X3	"	"	"	"
Y X4	"	"	"	"

Note: Microsoft Access is used as the database for storing data.

3.3.4 INPUT SPECIFICATION:

1) frm-linear-frm

Year	Population	Midpoint.
------	------------	-----------

ii) frm-Multi-frm

Population	Births	Deaths	Emigration	Immigration
	(X ₁)	(X ₂)	{ X ₃ }	(x ₄)

{iii} frm - reduce. Frm

Births (X ₁)	Death (X ₂)	migration {X ₃ }	M X ₄)
--------------------------	-------------------------	-----------------------------	--------------------

Enter values of X (1-4) derived from frm – linear to predict for X (population)

3.3.5 OUTPUT SPECIFICATION.

A computer output is communicated to the user either as a soft copy report on the screen or as a hard copy report on paper. The hard copy output of the report can be found in the appendix. These include predicted population data report, multiple regression analysis report and the hypothesis report.

Chapter Four

4.0 DATA PRESENTATION AND ANALYSIS;

This section examines derived and acquired data use for the different computations and varied analyses carried out. The different steps and procedures employed with respect are also highlighted. Then result obtain will find analyses in section below.

4.1 TABULAR PRESENTATIONS AND ANALYSES.

These were the statistical tools employed for presentation of derived and acquired data. In meeting the analytical aspect of regression and time series analysis, least square method were used, the test of hypothesis was done using the T- Test method.

Table 1.

NATIONAL POPULATION COMMISSION
Final Result of 1991 Population Census of Nigeria
Kaduna South Local Government Area
Kaduna State.

Locality	Males	Females	Both-Sexes	1996 Projection
Kurmin Mashi	10,573	9,453	20,026	23,406
Tudun Nupawa	21,124	18,187	39,311	45,945
Badikko	9,092	7,173	16,265	19,010
Anguwan Sanusi	12,512	11,459	23,971	28,017
Sabon Gari	29,421	26,167	55,588	64,969
Tudun Wada	31,199	29,100	60,299	70,476
K/ West-U/Muazu	19,596	18,117	37,713	44,078
Kakuri/Makera	41,540	35,834	77,374	90,482
Barnawa	17,553	15,131	32,684	38,200
Anguwan Television	14,783	13,561	28,344	33,128
Total	207,393	184,182	391,575	457,660

Source: National Population Commission Kaduna State.

Table 2.

**NATIONAL POPULATION COMMISSION
Final Result of 1991 Population Census of Nigeria**

LGA NAME	TOTAL
Birnin Gwari	143,072
Chikun	316,564
Igabi	308,239
Ikara	316,232
Jama'a	218,713
Kachia.	206,711
Kaduna. North	348,000
Kaura	101,455
Lere	116,284
Soba	205,727
Zango Kataf	174,217
Zaria	140,224
Markarfi	284,318
Sabon Gari	203,040
Jaba	224,067
Giwa	66,119
T/wada/Makera [Kaduna South]	391,575
Total	3,935,618

Source: National Population Commission-Kaduna State-Office

Table 3.

**TABULAR PRESENTATION OF PROJECTED POPULATION
Projected population Figures for Kaduna State.
Federal Republic of Nigeria**

YEAR	TOTAL POPULATION
1992	4,063,801
1993	4,196,159
1994	4,332,827
1995	4,473,948
1996	4,619,824
1997	4,770,126
1998	4,797,155
1999	4,944,078
2000	5,097,492
2001	5,254,179

Source: National Population Commission-Kaduna State-Office

4.2 Graphic Presentation and Analysis

Fig 1. Scattered Diagram of Population figures for Kaduna State.

Fig 2. Scattered Diagram of projected population figure for Kaduna state

Fig 3. Scattered diagram of Kaduna South LGA population census figures.

Fig 4. Bar chart showing the ratio of male to female population in Kaduna South LGA.

Fig 5. Bar chart showing computer derived figure from photograph compared to national census figure

TABLE4:

TABULAR PRESENTATION OF DERIVED POPULATION ESTIMATES FROM AERIAL PHOTOGRAPH.

Zones	No of house 1991	No of sample Houses	No of Person Per Sampled Per Zone	No of Person Per House	Computed No. of Persons per Zone
(Z)	(H)	(S)	(M)	(N)	(P)
A	352	30	773	25.76	9068
B	223	20	448	22.40	4995
C	261	20	238	11.50	3002
D	216	20	276	13.80	2981
E	161	10	113	11.30	1819
					ΣP=21865

Note:

H- represents No of house

S- " No of sampled house

M- " No of persons per sample per Zone

N- " No of person

P- " Computed No of Persons for Zone

Sample: about 10% H-----(1)

$$N = M/S \text{-----(2)}$$

$$P = N \times H \text{-----(3)}$$

$$\Sigma P = \Sigma [P_A + P_B + P_C + P_D + P_E] \text{---(4)}$$

4.3 REGRESSION ANALYSIS

There is need to derive the population from year 1991 to 1996 and compare our result with the given census projection, by the National Population Commission. In the process a regression equation can then evolve with which, future predictions can be made.

Therefore, a constant given by the population commission as 3% projection on population was used to derived the population estimate listed under Y-column. And given projected value are listed under X-column.

TABLE 5: POPULATION DERIVED USING 3% PROJECTION CONSTANT

YEAR	DERIVED POPULAION USING 3% PROJECTION ESTIMATE	GIVEN PROJECTED POPULATION VALUE
	Y	X
1991	21865	20026
1992	22521	20702
1993	23197	21378
1994	23893	22054
1995	24610	22730
1996	25348	23406

LEAST SQUARES SQUARE METHOD TO DERIVE A REGRESSION EQUATION:

$$y = c + mx \text{-----eqn.(1)}$$

$$\text{Where } m = \frac{\sum(x, -x)(y, -y)}{\sum(x, -x)^2} \text{-----eqn.(2)}$$

$$\text{and } c = y - mx \text{-----eqn.(3)}$$

The values in the table above, are fair large, therefore, for ease of manipulation, we reduce them by dividing each figure by 10,000.

Table 6: **REDUCED DERIVED AND PROJECTED POPULATION**

No	year	y	x
1	1991	2.1865	2.0026
2	1992	2.2521	2.0702
3	1993	2.3197	2.1378
4	1994	2.3893	2.2054
5	1995	2.4610	2.2730
6	1996	2.5348	2.3406

A Simplified approach was adopted in solving equation—(2)

Where:

$$Y = 2.3572;$$

$$X = 2.1716; \sum[(x - \bar{x})(y - \bar{y})] = 0.08239$$

$$\sum (X - \bar{x})^2 = 0.07996$$

$$m = 0.68239 / 0.07996$$

$$= 1.03039 \dots \dots \text{from equation-----[3]}$$

$$c = 2.35723 - 1.03039 \times 2.1716$$

$$= 0.11964 \quad \text{therefore}$$

$Y = c + mx \dots$ this is the prediction equation.

$$y = 0.11964 + 1.03039x$$

Using the prediction equation, estimates were derived for the year 1997 to 2001 from 1996 estimate

TABLE 7: **PREDICTED POPULATION ESTIMATE.**

YEAR	Predicted Estimate.
1996	2,5348
1997	2,6118
1998	2,6912
1999	2,7730
2000	2,8573
2001	2,9441

4.4 Time Series Analysis

Time series analysis using least squares method. The estimated simple linear regression model is defined by equation:

$$Y = a + bX \text{ -----eqn... [4]}$$

where Y = estimate population

X = is the period of time (in years)

a = y intercept of the equation line

i.e. value of y when x =0

b = the slope i.e. the amount of change in x.

The following steps were taken in solving least square equation for the time series analysis.

Step 1: Considering eqn. --- (4) above, a and b were determined by least square method, by solving simultaneously normal equation.

$$\sum[y] = N[a] + b \sum[x] \text{ ----- (5a)}$$

$$\sum[x y] = a\sum[x] + b \sum[X]2 \text{ ----- (5b)}$$

Where N is the number of observation (i.e. years covered by the time series)

Step 2: In order to simplify the use of these formulae above, X should be coded such that its summation is always equal to zero.

Step 3: The population figure for the years 1991-2001, were vested, have reduced them by dividing by 10000.

Table 7: Showing Time Series Analysis.

YEAR	Y	X	X2	XY	Y2
1991	2.1865	-5	25	-10.9325	4.7808
1992	2.2521	-4	16	-9.0084	5.0720
1993	2.3197	-3	9	-6.9591	5.3010
1994	2.3893	-2	4	-4.7786	5.7088
1995	2.4610	-1	1	-2.4610	6.0565
1996	2.5348	0	0	0	6.4252
1997	2.6118	1	1	2.6118	6.8215
1998	2.6912	2	4	5.3824	7.2456
1999	2.7730	3	9	8.3190	7.6895
2000	2.8573	4	16	11.4292	8.1642
2001	2.9441	5	25	14.7205	8.6677
Total	28.0208	0	110	8.3233	72.0097

From the table 7 above, we have the followings.

$$Y = 28.0208$$

$$\sum x^2 = 110$$

$$\sum xy = 8.3233$$

$$\sum y^2 = 72.0097$$

Chapter Five

5.0 SUMMARY OF RESULTS.

This chapter will examine the problems encountered during the execution of this project and present the findings; implications of the findings, before drawing the necessary conclusions and recommendations.

5.1 PROBLEMS ASSOCIATED WITH POPULATION ENUMERATION.

Before one can make analysis of the results obtained both in the field, and the use of aerial photograph. It is necessary to consider the several factors that may affect the accuracy of the final estimate. Thereby arriving at a reasonable conclusion as regards the accuracy of the later method. Among this are:

a] Finance- we all know is the life wire of any research; this is not an exemption, since the resource available was very limited; prompting the scaling down of the project size. This it is believed must have in one way or the other affected the result obtained.

b] Inexperience- we should realized that as photogrammetrist's we have limited knowledge of population enumeration, since so many things must have being taken for granted.

c] False Proclamation-due to lack of proper briefing or enlightenment, there is tendency that household head's give false information, which were unverifiable. Because, their wife [/ wives] was in most cases not seen, neither were we allowed to count the children physically.

d] Religious Beliefs-which prohibits the father counting the number of children or women in purdah, coupled with warning notices of "No Entry" or "Ba'a Shiga."

e] Evasion of Tax-since most adult thought the exercise was a ploy to get at tax dodgers, they in most cases took to their heels.

f] Illiteracy- since most of the inhabitants are admixtures of farmers and semi-literate low-income earner, explaining the purpose of the exercise to them was not easy, this affected the speed of the enumeration.

g] Administrative Bottleneck- it took a lot of persuasion to convince the local government authority about the sincerity of the purpose of the exercise.

h] Photographic Errors- this may include:

- 1] Interpretation error
- 2] Measurement error
- 3] Delineating of the boundaries of the zones

- 4] The gap between the date of photography and the date of enumeration
- 5] Non residential areas or buildings were assumed to contain no population, which is generally not true.
- 6] The quality of the photographs used.

5.2 CONCLUSION AND RECOMMENDATION

Using the time series analysis to derive an estimate for a five years period between 1997-2001, then comparing the derived value with the predicted value for year 2001. The % difference is 0.5%.

Therefore, using the time series analysis, the result showed that, there was a significant increase in population figures in the area examined vis-a-vis the whole of Kaduna State, for every unit increase in time. The test was conducted using sample data for a period of eleven years, between 1991-2001.

The test of hypothesis was also carried out, using the student's T-Test, the result of the statistical test between population and time at 5% level of significance with a 9-degree of freedom, gave a t-value of 1.88333 {critical value from tables} and an observed value of 20.4387. This significance level was chosen because of its general application in many statistical researches; thus often considered a standard by researchers.

This value shows a very significant difference, since the observed value was greater than the critical or tabulated value, thus falling in the rejection region. As such, the null hypothesis was rejected in favour of the alternative hypothesis.

It can be said that, the result obtain here cannot be said to hold for a bigger urban areas, where the population is extremely diverse, because it shows a deviation of between 0.5% - 6%.

It was found that population estimation is subject to errors, cause by low homogeneity of residential classes with respect to population density. Therefore the acceptability of the result will depend on the purpose of the population estimate.

If the average population density for a residential class has to be based on population counts in the sampled zonal areas, then a sufficient number of residential classes must be selected.

Estimates that are usually considered on the bases of average population for a given area may seldom satisfy any planning needs.

Because of the low homogeneity of the residential classes, housing occupancy rates vary considerably in the sampled zone areas and do not seems to explain coherently the variations in population densities.

Interpretation of aerial photographs can give a classification of residential areas and measurements of either the net or gross residential areas in the

census zones. Combining this with the census data can give class-specific densities, which can be used as input for population estimates in newly built-up areas.

Bearing the above observations, one can recommend that the Population Commission at both federal and the state levels, should from time to time, commission demographers and photogrammetrist, to carry out population analysis and estimates from existing aerial photographs and census materials; for the purpose of drawing up population average for the different communities within the state.

The advent of modern instrumentation and techniques, calls for serious research in this direction, since, it will enhance the pre-census result for remote villages, that are seldom reached during actual census enumeration.

Government should make population education mandatory in all our institutions of higher learning; to create the necessary awareness on population statistics.

There is a dear need for a vigorous enlightenment campaign to sensitize the populace as to the importance of registering both birth and death.

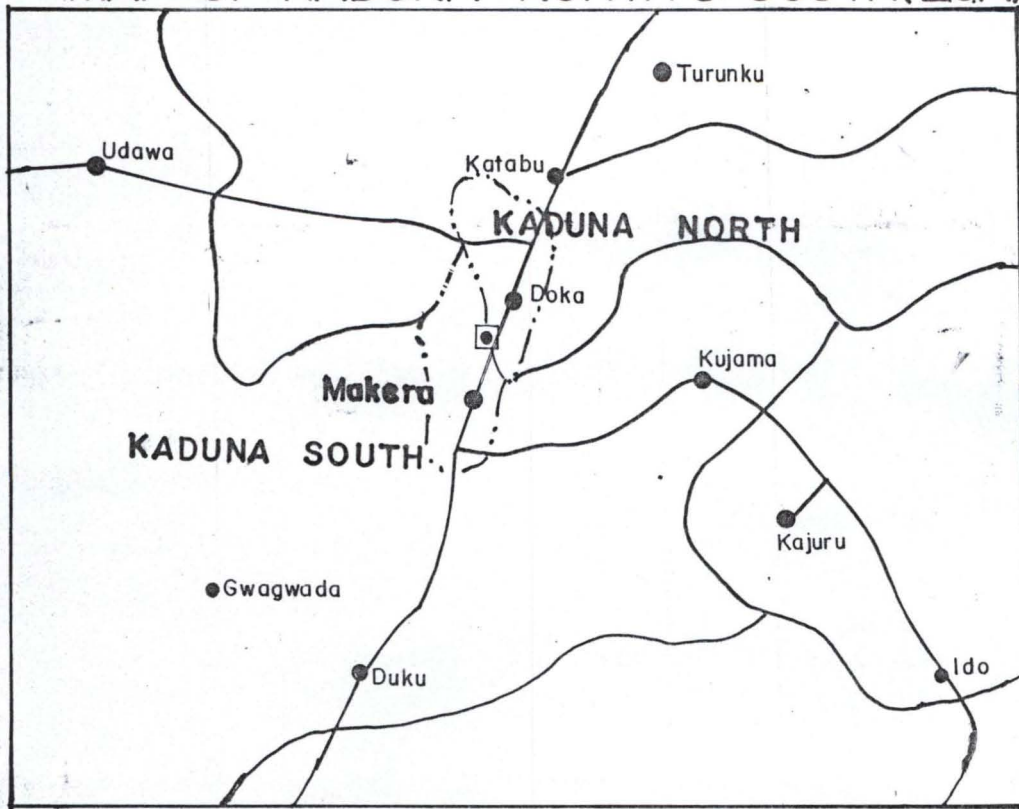
The use of handy GPS and GIS instruments will enhance the collation of data and data analysis when incorporated with computer assisted plotters.

REFERENCES

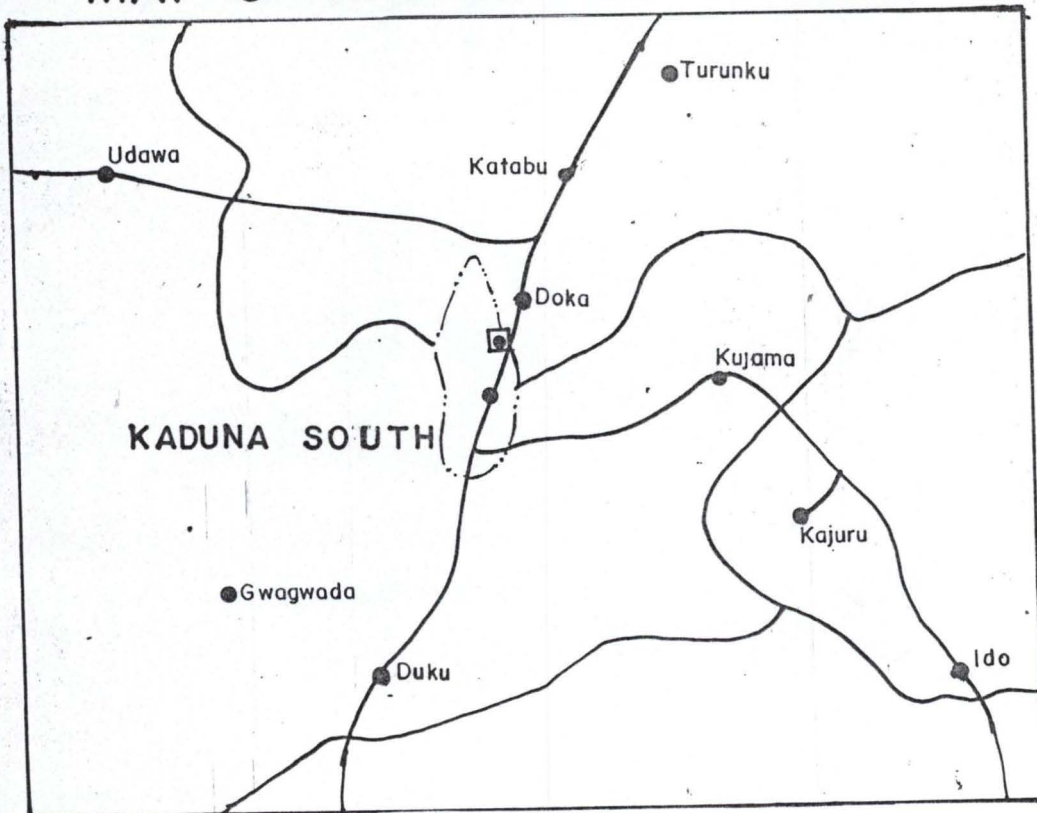
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APPENDICES

MAP OF KADUNA NORTH & SOUTH(LGA)



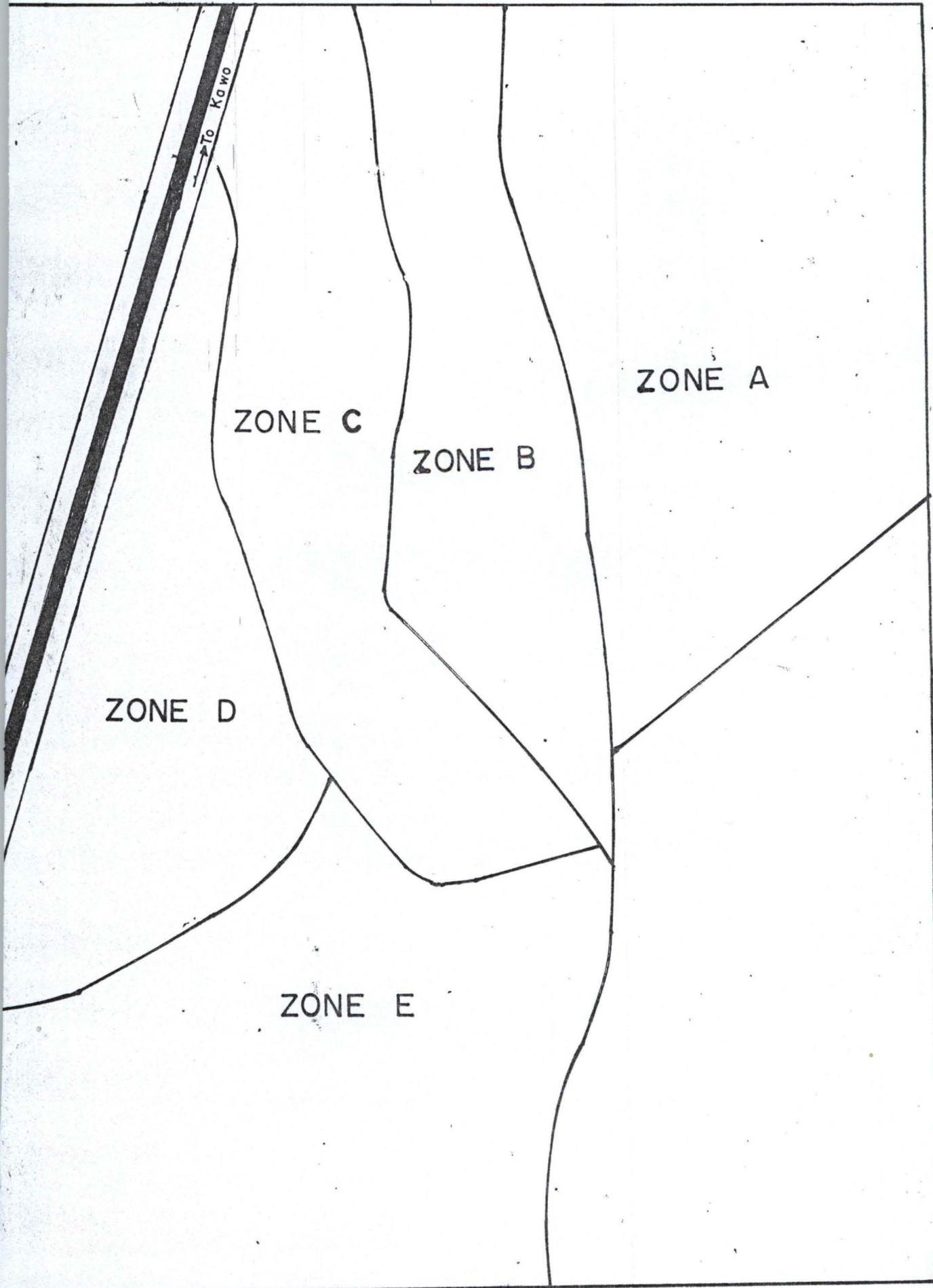
MAP OF KADUNA SOUTH(L.G.A)



Aerial Photograph showing Kurmin Mashi
scale 1: 10,000



MAP SHOWING ZONES (SCALE: 1:10,000)



ZONE C

ZONE B

ZONE A

ZONE D

ZONE E

Sample Questionnaire

This questionnaire is aimed at assisting the researcher to obtain the necessary data to enable him carryout his project in partial fulfillment for the award of Post Graduate Diploma in Computer Science.

Please kindly assist the researcher by providing appropriate answers to the questions below. Thank you for your anticipated cooperation.

Name of Researcher.....
Institution.....
Department.....
Date.....

Section A

What are the major achievements of NPC?

- [I]
- [ii]
- [iii]
- [iv]

What the problems that being encountered by NPC?

- [I]
- [II]
- [III]
- [iv].....

What prospect has NPC in future?

- [I]
- [ii]
- [iii]
- [iv]

What methods do you use in analyzing population data [statistically]?

.....
.....
.....

If computerized, what type of software do you use?

.....
.....

If program are written, what programming language were used?

.....
.....

What are the population figures of?

- [I] Kaduna State.....
- [ii] Kaduna South LGA.....

What are the projected figures for 1996 and 2001?.....
.....

Sample Questionnaire

This questionnaire is aimed at assisting the researcher to obtain the necessary data to enable him carryout his project in partial fulfillment for the award of Post Graduate Diploma in Computer Science.

Please kindly assist the researcher by providing appropriate answers to the questions below. Thank you for your anticipated cooperation.

Name of Researcher.....

Institution.....

Department.....

Date.....

Section B

Pilot survey on population of Kurmin Marshi Area Kaduna Township

Street Name.....

House Number.....

Name of Household Head.....

Number of Wife/ Wives.....

Number of Children.....

Number of Dependant Relations.....

PROGRAM IMPLEMENTATION TECHNIQUE.

This refers to the explicit documentation of how the developed software operates. Visual Basic {Version 5.0} was used in designing the program for this project.

Visual Basic 5.0 is an object-oriented language, as such it allows programming of processes that enables automation of any activity.

Three components of the program includes:

{a} User interface is design via form design.

{b} Setting of object properties.

{c} Program codes are added to objects.

The Main Menu

The main menu has a pull down menu that consists of the following options.

{I} Population

{ii} Report

{iii} Exit.

{i} The **Population** Option consist of the followings.

- ⌚ Linear Method of Computation
- ⌚ Multiple Regression Observation Entry

The Linear Method of Computation when clicked opens the linear computation form where entries can be made for the year, Population; Mid-point while X and XY are auto-generated

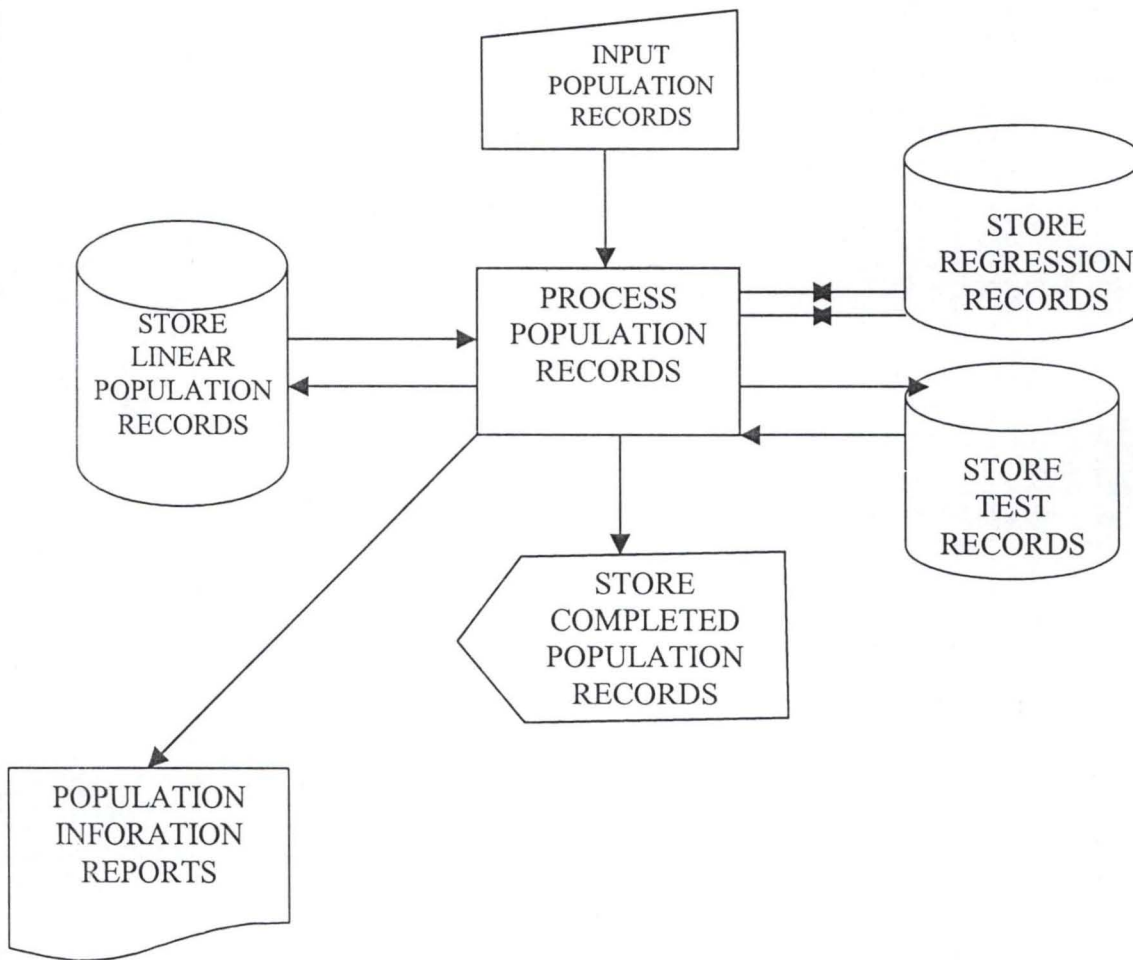
In order to predict any of the variables e.g. population, the mid-point of the year to be predicted is entered, calculated as year of prediction minus year with mid-point zero, then the process button is clicked.

Similarly, the Multiple Regression Observation Entry when clicked opens the multiple regression form where entries can be made for year and population, while others are auto-generated. In order to predict population for any year, the process button is clicked.

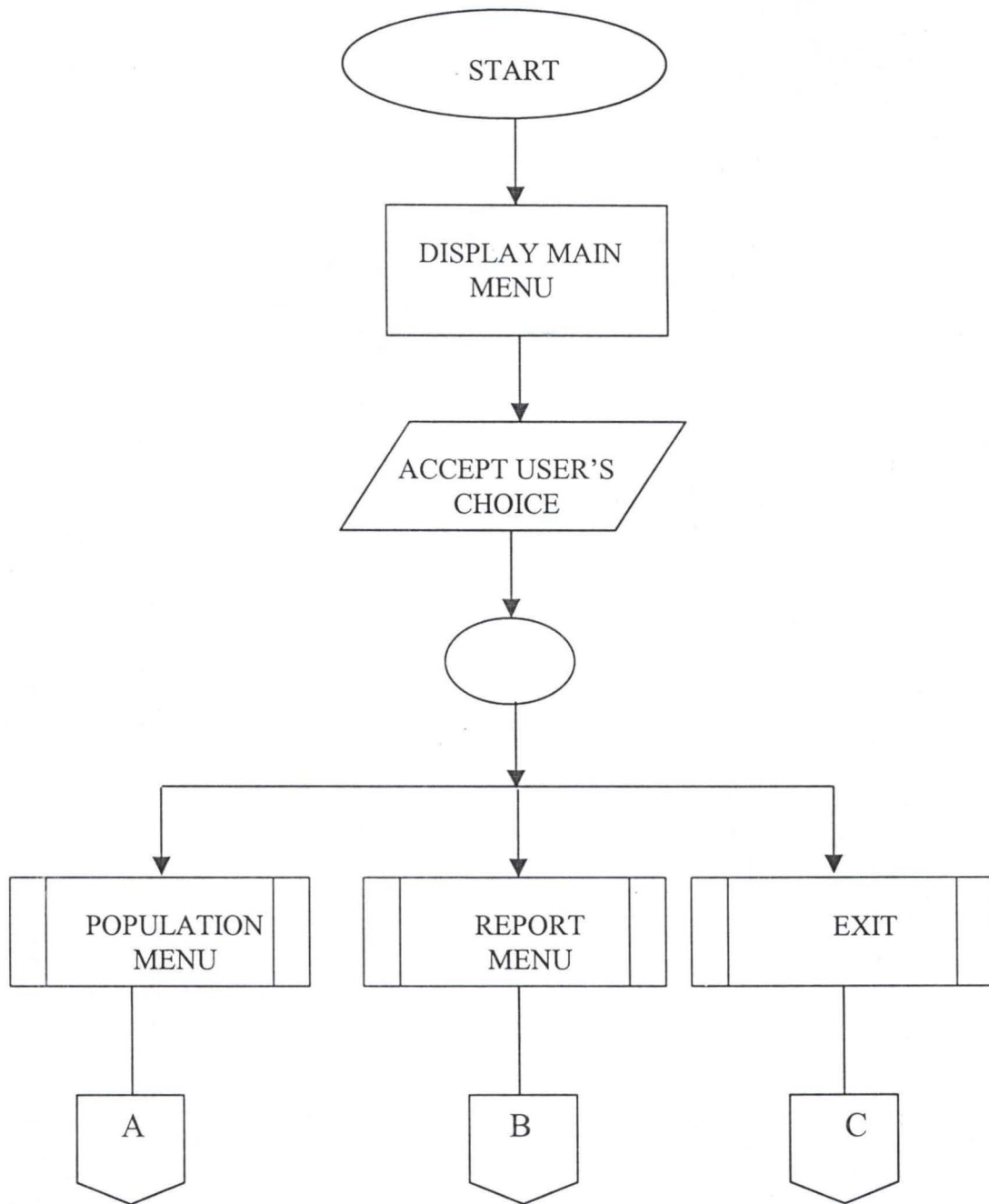
{ii} The **Report** Option allows the various reports as specified to be generated either as a soft copy or as a hard copy.

{iii} The **Exit** Option indicates that the user is leaving the program environment. In other word, it allows the user to end a task completely.

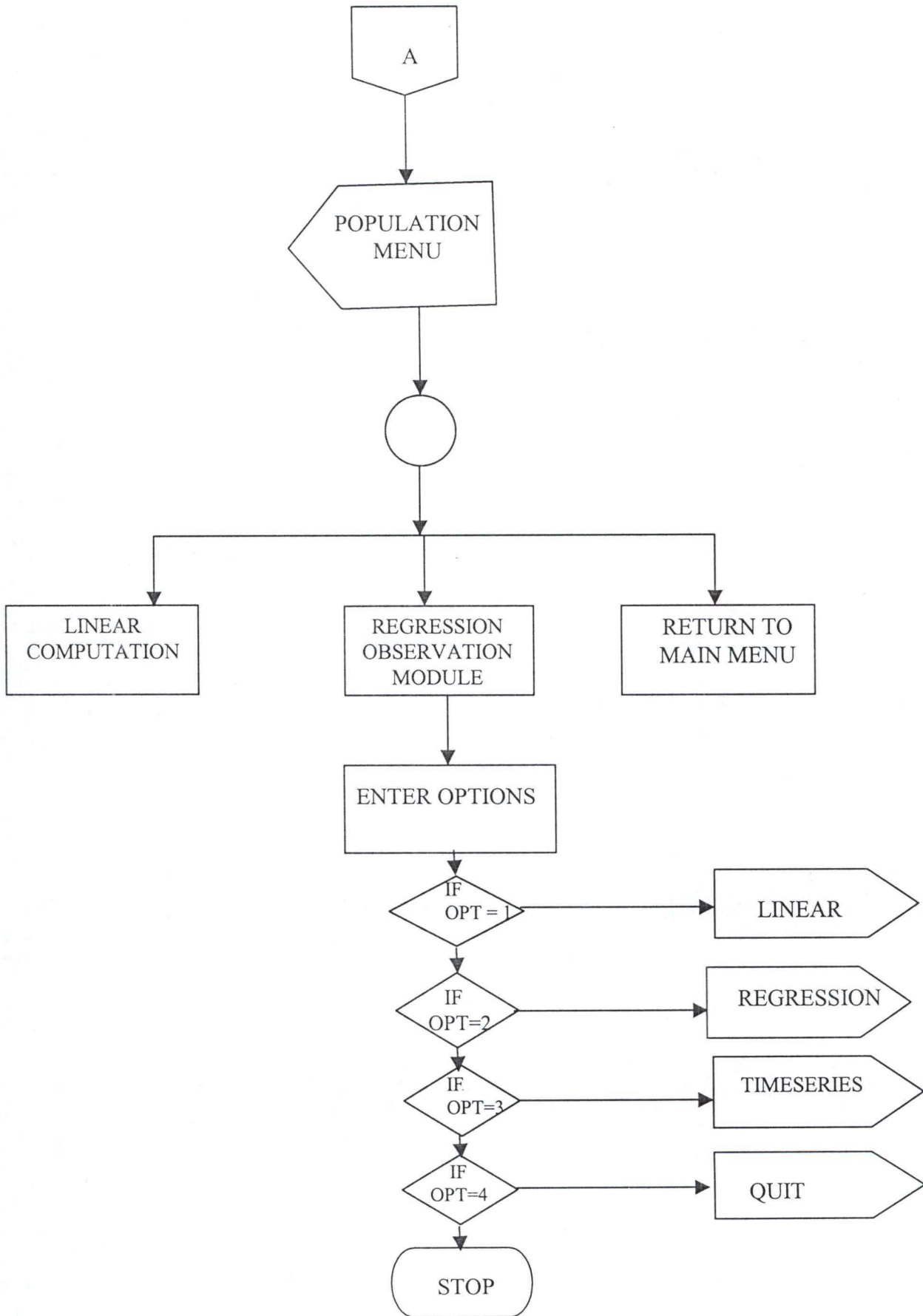
SOFTWARE DESIGN AND ANALYSIS
SYSTEM FLOW CHART



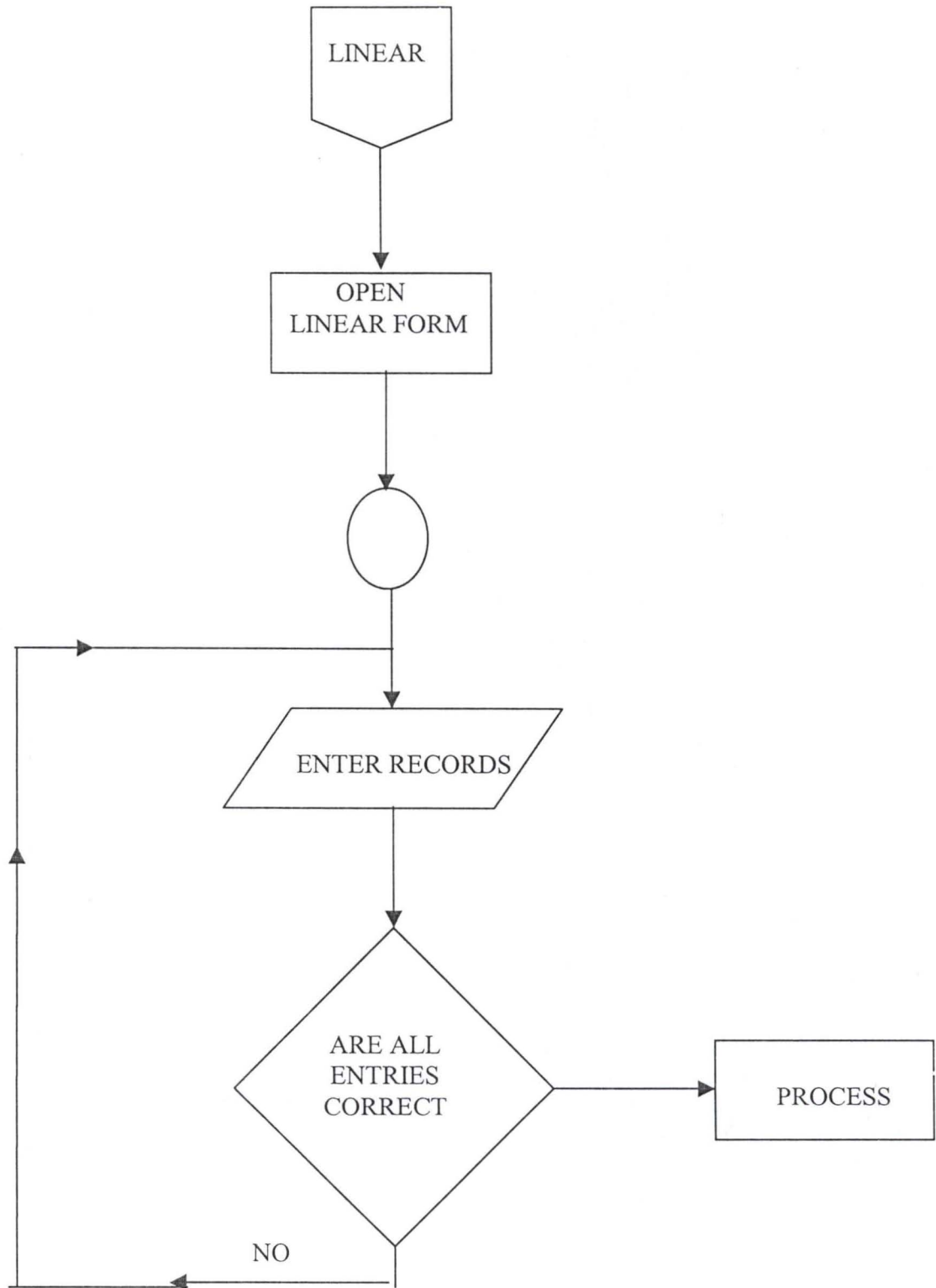
PROGRAM FLOW CHART MAIN MENU



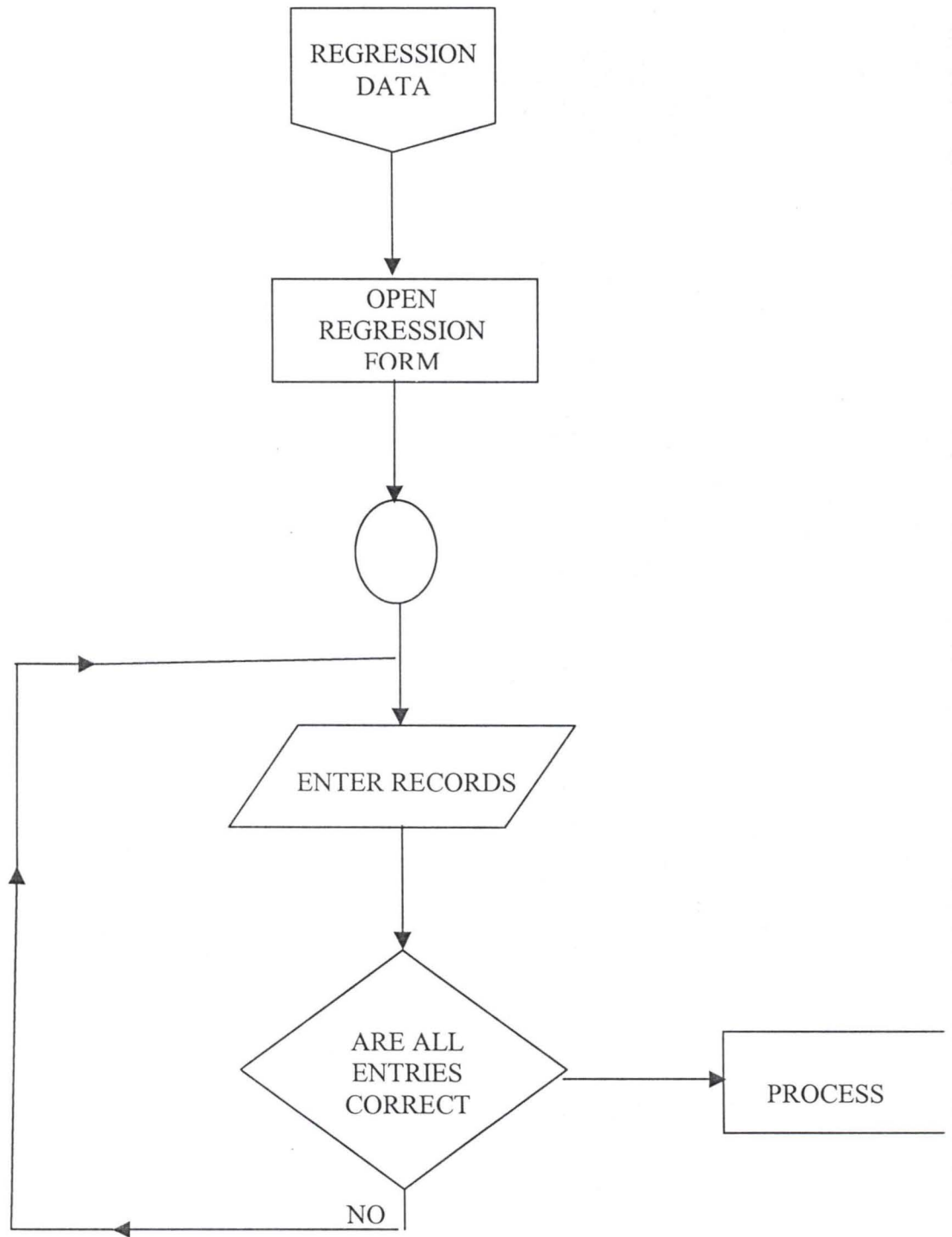
POPULATION MENU



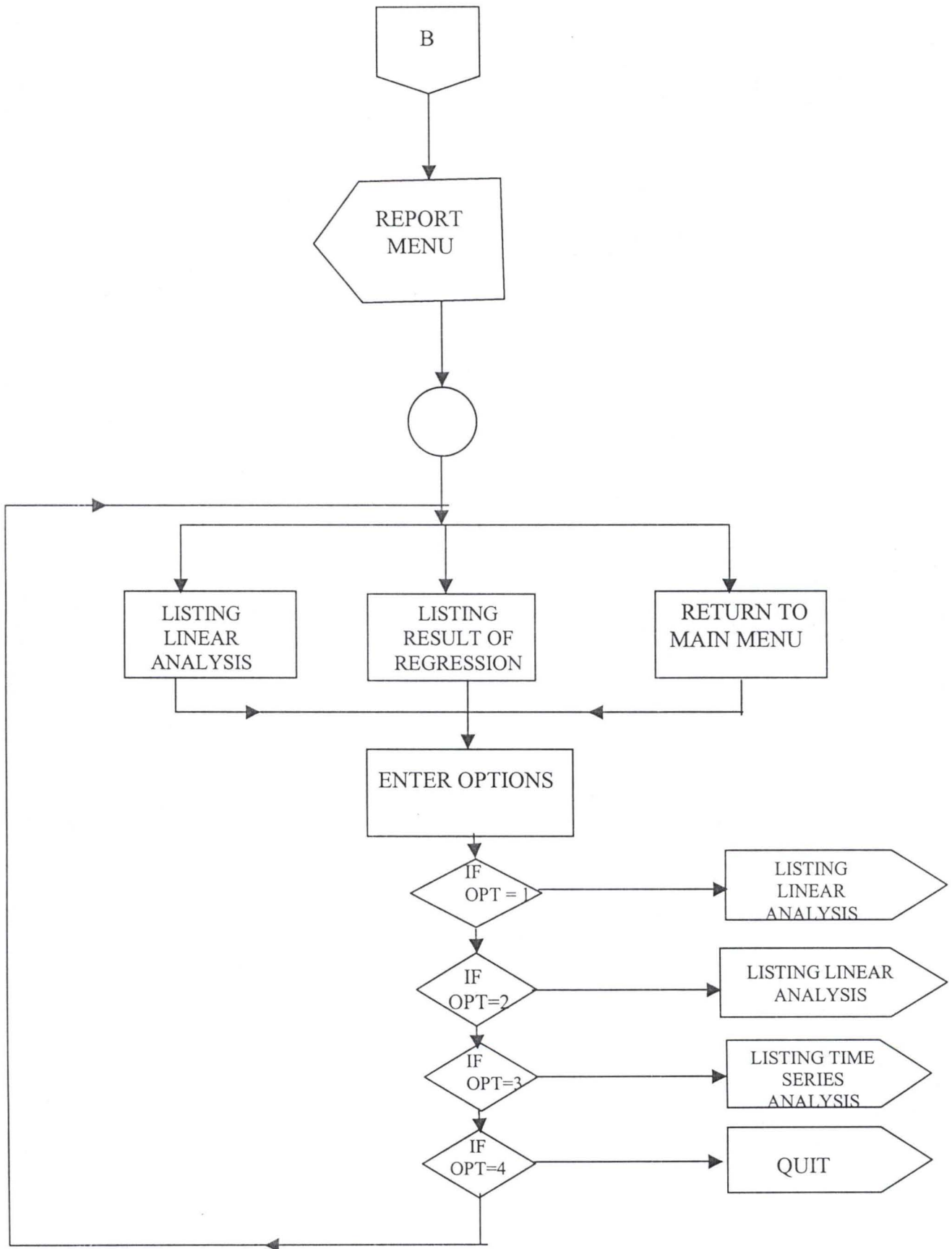
LINEAR COMPUTATION ROUTINE



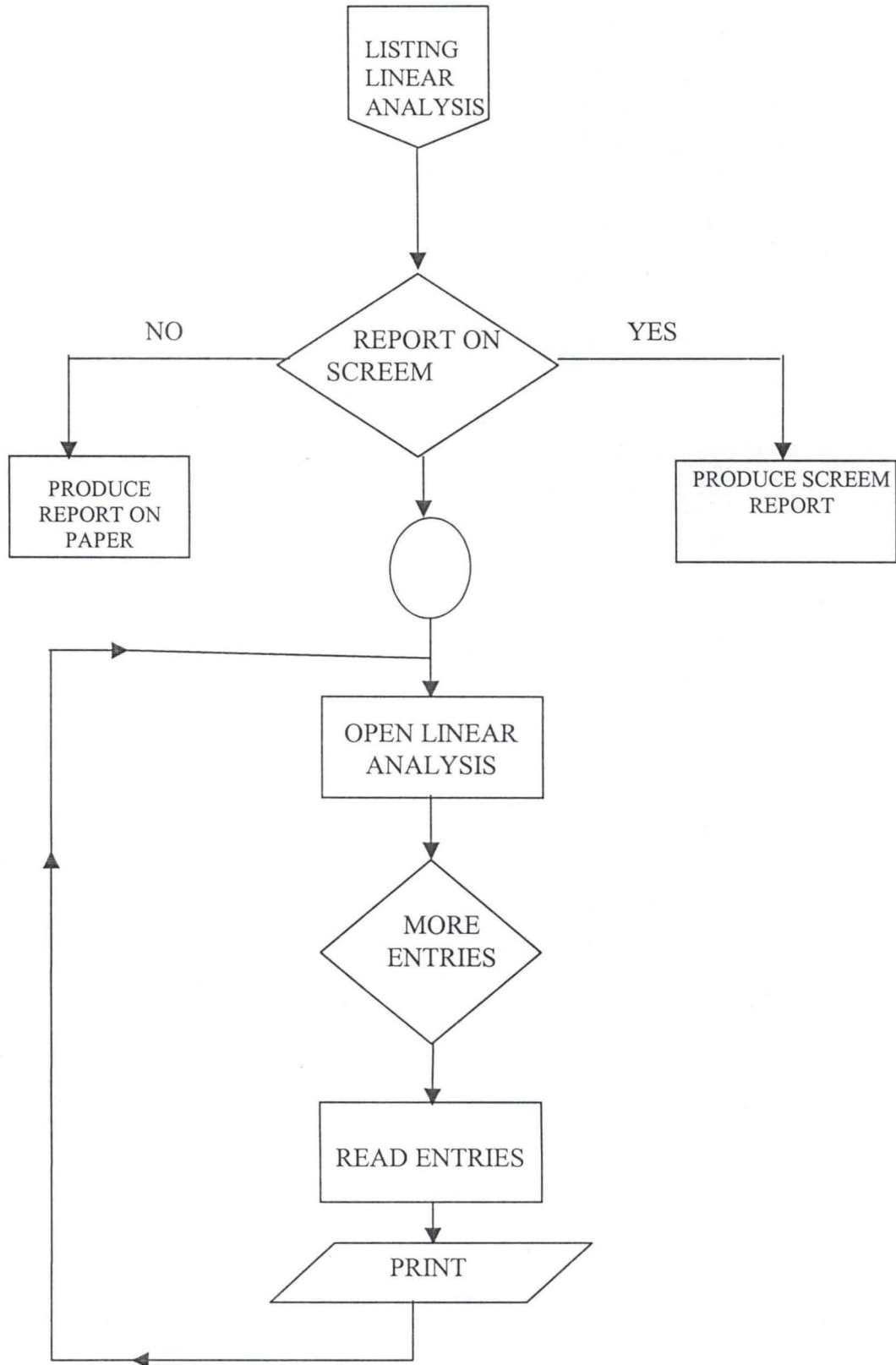
REGRESSION ANALYSIS ROUTINE



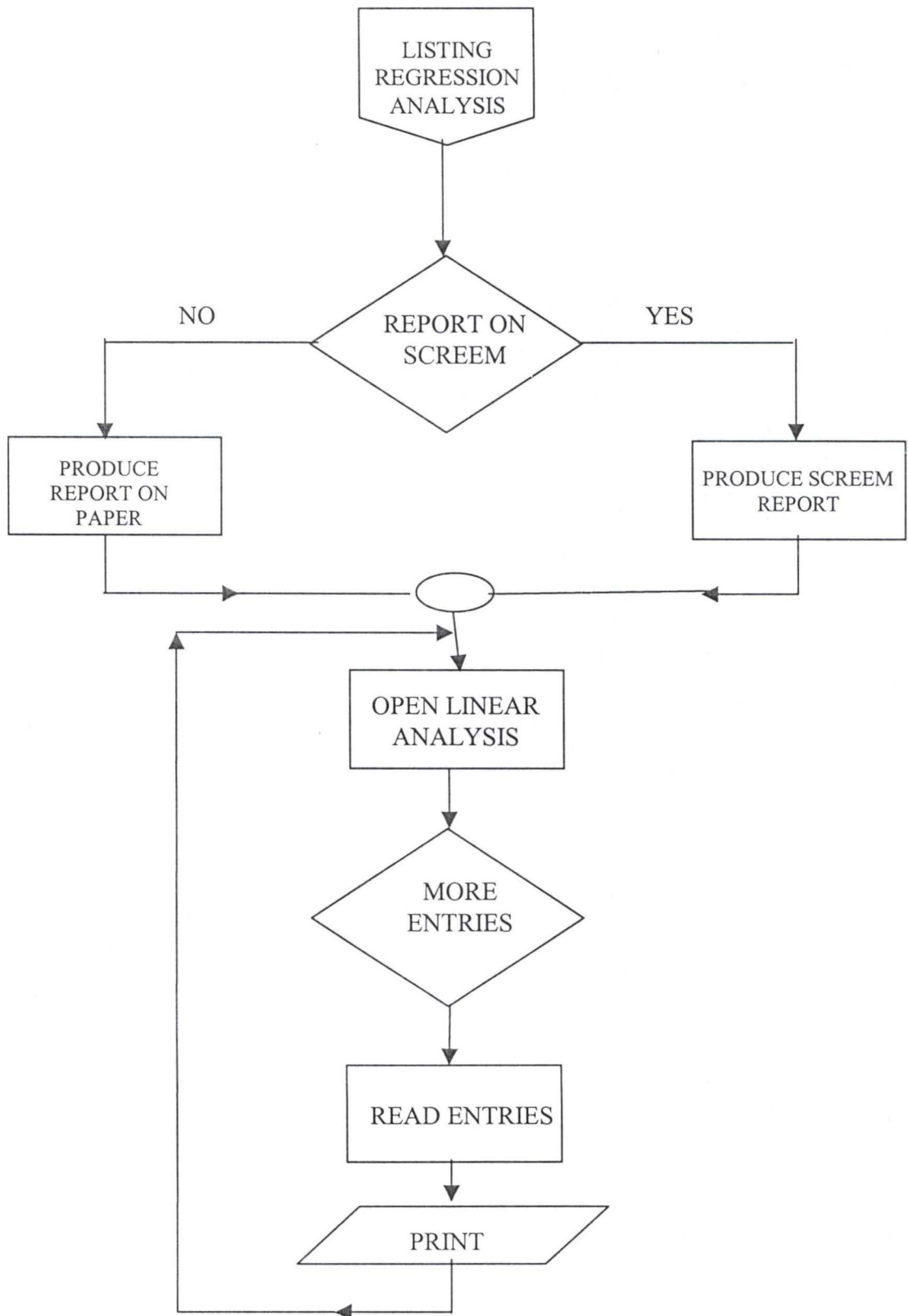
REPORT LISTING MENU

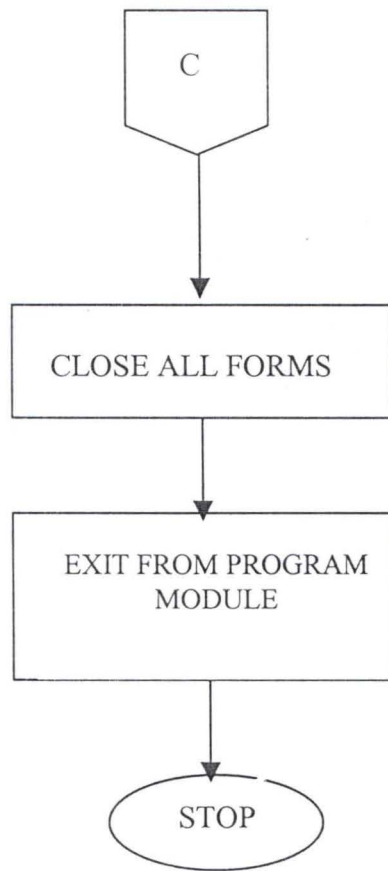


LISTING LINEAR ANALYSIS REPORT



LISTING REGRESSION ANALYSIS REPORT





PROGRAM LISTING

REM=A PROGRAM FOR POPULATION ESTIMATION BY O.R.ADEBISI

VERSION 5.00

Object="{67397AA1-7FB1-11D0-B148-00A0C922E820}#6.0#0";"MSADODC.OCX"

Object="{CDE570A40-8B86-11D0-B3C6-00A0C90AEA82}#1.0#0";"MSDATGRD.OCX"

Begin VB.Form Frm_linear

Caption="Linear Computation Form"

ClientHeight=6225

ClientLeft=60

ClientTop=345

ClientWidth=6615

LinkTopic="Form1"

ScaleHeight=6225

Scale width=6615

StartUpPosition=3 'Window Default

Begin VB.CommandButton Command 4

Caption= "Send To Printer"

Height=495

Left=4560

TabIndex=18

Top=5640

Width=1335

END

Begin VB.CommandButton Command 3

Caption="Clear Set Of Data"

Height=495

Left=2880

TabIndex=16

Top=5640

Width=1335

END

Begin VB.CommandButton Command 2

Caption="Delete Rec"

Height=375

Left=240

TabIndex=15

ToolTipText="Delete Current Record"

Top=5760

Width=1095

END

Begin VB.TextBox Text 1

Height=285

Left=3720

TabIndex=12

Text=" "

Top=4320

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Width=615
END
Begin VB.CommandButton Command1
Caption="Process"
Height=255
Left=2640
TabIndex=6
Top=4920
Width=1335
END
Begin MSDataGridLib.DataGrid DataGrid1
Bindings="frm_linear.frx":0000
Height=2775
Left=0
TabIndex=0
Top=720
Width=6495
_ExtentX=11456
_ExtentY=4895
_Version=293216
AllowUpdate=-1'True
HeadLines=1
RowHeight=15
FormatLocked=-1'True
AllowAddNew=-1'True
AllowDelete=-1'True
Begin Property Font{0BE35203-8F91-11CE-9DE3-00AA004BB851}
Name="OR ADEBISI"
size=8.25
Charset=0
Weight=400
Underline=0 'False
Italic=0 'False
Stikethrough=0 'False
ENDProperty
BeginProperty Font{0BE35203-8F91-11CE-9DE3-00AA004BB851}
Name="OR ADEBISI"
size=8.25
Charset=0
Weight=400
Underline=0 'False
Italic=0 'False
Stikethrough=0 'False
ENDProperty
Caption="Linear Projectio of Population"
ColumnCount=6
```

BeginProperty Column 00
DataField="Year"
BeginProperty DataFormat{6D835690-900B-11D0-9484-00AA0C91110ED}
Type=0
Format=""
HaveTrueFalseNull=0
FirstDayOfWeek=0
FirstDayOfYear=0
LCID=1033
SubFormatType=0
EndProperty
EndProperty
BeginProperty Column 01
DataField="Population"
Caption="Population"
BeginProperty DataFormat{6D835690-900B-11D0-9484-00AA0C91110ED}
Type=1
Format="#,##0"
HaveTrueFalseNull=0
FirstDayOfWeek=0
FirstDayOfYear=0
LCID=1033
SubFormatType=0
EndProperty
EndProperty
BeginProperty Column 02
DataField="Popu_Mil"
Caption="Population[Y]"
BeginProperty DataFormat{6D835690-900B-11D0-9484-00AA0C91110ED}
Type=1
Format="#,##0.000000"
HaveTrueFalseNull=0
FirstDayOfWeek=0
FirstDayOfYear=0
LCID=1033
SubFormatType=0
EndProperty
EndProperty
BeginProperty Column 03
DataField="Mid_Point"
Caption="X[Mid_Point]"
BeginProperty DataFormat{6D835690-900B-11D0-9484-00AA0C91110ED}
Type=1
Format="#,##0.000000"
HaveTrueFalseNull=0
FirstDayOfWeek=0

FirstDayOfYear=0
LCID=1033
SubFormatType=0
EndProperty
EndProperty
BeginProperty Column 04
DataField="Mid_PointSq"
Caption="XSq"
BeginProperty DataFormat{6D835690-900B-11D0-9484-00AA0C91110ED}
Type=0
Format=""
HaveTrueFalseNull=0
FirstDayOfWeek=0
FirstDayOfYear=0
LCID=1033
SubFormatType=0
EndProperty
EndProperty
BeginProperty Column 05
DataField="Mid_X_PopMil"
Caption="XY"
BeginProperty DataFormat{6D835690-900B-11D0-9484-00AA0C91110ED}
Type=0
Format=""
HaveTrueFalseNull=0
FirstDayOfWeek=0
FirstDayOfYear=0
LCID=1033
SubFormatType=0
EndProperty
EndProperty
SplitCount=1
BeginProperty Split 0
BeginProperty Column 00
ColumnWidth=659.906
EndProperty
BeginProperty Column 01
ColumnWidth=1065.26
EndProperty
BeginProperty Column 02
ColumnWidth=1124.787
EndProperty
BeginProperty Column 03
ColumnWidth=1094.74
EndProperty
BeginProperty Column 04

ColumnWidth=900.284
EndProperty
BeginProperty Column 05
ColumnWidth=1065.26
EndProperty
EndProperty
End
Begin MSAdodcLib.Adodc Adodc 2
Height=375
Left=4440
Top=3840
Visible=0 'False
Width=1935
_ExtentX=3413
_ExtentY=661
ConnectionMode=0
CursorLocation=3
IsolationLevel=-1
ConnectioTimeout=15
CommandTimeout=30
CursorType=3
LockType=3
CommandType=1
CursorOptions=0
CacheSize=50
MaxRecord=0
BOF Action=0
EOF Action=0
ConnectionStringType=3
Appearance=1
BackColor=-2147483643
ForeColor=-2147483640
Orientation=0
Enabled=-1
Connect="DSN=population"
OLEDBString=""
OLEDBFile=""
DataSourceName="population"
OtherAttributes=""
UserName=""
Password=""
RecordSource="\$"frm_linear.frx":0015
Caption="Adodc2"
BeginProperty Font{0BE35203-8F91-11CE-9DE3-00AA004BB851}
Name="OR ADEBISI"
size=8.25

Charset=0
Weight=400
Underline=0 'False
Italic=0 'False
Stikethrough=0 'False
ENDProperty
_Version=393216
End
Begin MSAdodcLib.Adodc Adodc 1
Height=375
Left=1920
Top=3840
Width=2535
_ExtentX=4471
_ExtentY=661
ConnectionMode=0
CursorLocation=3
IsolationLevel=-1
ConnectioTimeout=15
CommandTimeout=30
CursorType=3
LockType=3
CommandType=2
CursorOptions=0
CacheSize=50
MaxRecord=0
BOF Action=0
EOF Action=0
ConnectionStringType=3
Appearance=1
BackColor=-2147483643
ForeColor=-2147483640
Orientation=0
Enabled=-1
Connect="DSN=population"
OLEDBString=""
OLEDBFile=""
DataSourceName="population"
OtherAttributes=""
UserName=""
Password=""
RecordSource="linear_tab"
Caption="Navigate Data"
BeginProperty Font{0BE35203-8F91-11CE-9DE3-00AA004BB851}
Name="MS OR ADEBISI"
size=8.25


```
Charset=0
Weight=400
Underline=0 'False
Italic=0 'False
Stikethrough=0 'False
ENDProperty
_Version=393216
End
Begin VB.Label Label 9
Alignment=2'Center
Auto Size=-1'True
Caption="Linear Projection Of Population"
BeginProperty Font{0BE35203-8F91-11CE-9DE3-00AA004BB851}
Name="OR ADEBISI"
size=13.5
Charset=0
Weight=700
Underline=0 'False
Italic=0 'False
Stikethrough=0 'False
ENDProperty
ForeColor=&H00FFFF00&
Height=360
Left=1125
TabIndex=17
Top=120
Width=4365
END
Begin VB.Label Label 8
BorderStyle=1'Fixed Single
Caption=""
Height=255
Left=840
TabIndex=14
Top=5400
Width=1455
END
Begin VB.Label Label 7
BorderStyle=1'Fixed Single
Caption="Y="
BeginProperty Font{0BE35203-8F91-11CE-9DE3-00AA004BB851}
Name="OR ADEBISI"
size=9.75
Charset=0
Weight=700
Underline=0 'False
```

```
Italic=0 'False
Stikethrough=0 'False
ENDProperty
Height=255
Left=360
TabIndex=13
Top=5400
Width=375
END
Begin VB.Label Label 6
BorderStyle=1'Fixed Single
Caption="Enter nPrediction"
Height=255
Left=2280
TabIndex=11
Top=4320
Width=1335
END
Begin VB.Label Label 5
BorderStyle=1'Fixed Single
Caption=""
Height=255
Left=4680
TabIndex=10
Top=4680
Width=1575
END
Begin VB.Label Label 4
BorderStyle=1'Fixed Single
Caption=""
Height=255
Left=720
TabIndex=9
Top=4680
Width=1575
END
Begin VB.Label Label 3
BorderStyle=1'Fixed Single
Caption="b="
Begin VB.Label lbl_XY
BorderStyle=1'Fixed Single
Caption=""
DataField="Sum_popMil"
BeginProperty DataFormat{6D835690-900B-11D0-9484-00AA0C91110ED}
Type=1
Format="#,##0.000000"
```

```
HaveTrueFalseNull=0
FirstDayOfWeek=0
FirstDayOfYear=0
LCID=1033
SubFormatType=1
EndProperty
DataSource="Adodc2"
Height=255
Left=5520
TabIndex=5
Top=3480
Width=975
END
Begin VB.Label lbl_Xsq
BorderStyle=1'Fixed Single
Caption=""
DataField="Sum_Msq"
BeginProperty DataFormat{6D835690-900B-11D0-9484-00AA0C91110ED}
Type=1
Format="0.000"
HaveTrueFalseNull=0
FirstDayOfWeek=0
FirstDayOfYear=0
LCID=1033
SubFormatType=1
EndProperty
DataSource="Adodc2"
Height=255
Left=4560
TabIndex=4
Top=3480
Width=975
END
Begin VB.Label lbl_X
BorderStyle=1'Fixed Single
Caption=""
DataField="Sum_Mid"
BeginProperty DataFormat{6D835690-900B-11D0-9484-00AA0C91110ED}
Type=1
Format="0.000"
HaveTrueFalseNull=0
FirstDayOfWeek=0
FirstDayOfYear=0
LCID=1033
SubFormatType=1
EndProperty
```

```
DataSource="Adodc2"
Height=255
Left=3600
TabIndex=3
Top=3480
Width=975
END
Begin VB.Label lbl_pop
BorderStyle=1'Fixed Single
Caption=""
DataField="Sum_p"
BeginProperty DataFormat{6D835690-900B-11D0-9484-00AA0C91110ED}
Type=1
Format="#.##0.000000"
HaveTrueFalseNull=0
FirstDayOfWeek=0
FirstDayOfYear=0
LCID=1033
SubFormatType=1
EndProperty
DataSource="Adodc2"
Height=255
Left=2400
TabIndex=2
Top=3480
Width=1215
END
Begin VB.Label l
BorderStyle=1'Fixed Single
Caption="Summation->"
Height=255
Left=240
TabIndex=1
Top=3480
Width=1215
End
End
Attribute VB_NAME="Frm_linear"
Attribute VB_GlobalNameSpace=False
Attribute VB_Creatable=False
Attribute VB_Predeclared=True
Attribute VB_Exposed=False
Private Subcommand 1_Click()
Dim rec_no As interger,sng_pop As Single,sng_xy As single,sng_xsq
Dim a As Single
Dim b As Single.reg As Single
```

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rec_no=Adodc1.Recordset.RecordCount
Adodc2.Recordset.MoveFirst
a=IbI_pop.Caption/rec_no
b=IbI_XY.Caption/IbI_xsqr.Caption
Label4.Caption=aLabel5.Caption=b
If IsNumeric[Text1.Text] Then
reg=a+[b*Text1.Text]
Else
MsgBox ["Enter Prediction Figure"]
Text1.SetFocus
End If
Label8.Caption=reg
End Sub
Private Sub Command2_Click[]
Adodc1.Recordset.Delete[adAffectCurrent]
Adodc1.Rfresh
DataGrid1.Refresh
Adodc1.Recordset.MoveFirst
Adodc2.Rfresh
DataGrid1.Refresh
End Sub
Private Subcommand3_Click()
Adodc1.Recordset.MoveFirst
delete all the records in the table
Do While Not Adodc1.Recordset.EOF
Adodc1.Recordset.dELETYE [1]
Adodc1.Recordset.MoveNext
Loop
Adodc1.Rfresh
Adodc2.Rfresh
DataGrid1.Refresh 'update the data grid with adequate record set
End Sub
Private Subcommand4_Click()
Me.PrintForm
End Sub
Private Sub DataGrid1_KeyPress[KeyAscii As Integer]
Dim data As Single, data2 As Single
On Error Resume Next
'compute entry into other columns
If Key Ascii=13 And DataGrid1.Col=1 Then
DataGrid1.Columns[2]=CSng[CSng[DataGrid1.Columns[1]]/1000000]
End If
If Key Ascii=13 And DataGrid1.Col=3 Then
DataGrid1.Columns[4]=DataGrid1.Columns[3]^2
DataGrid1.Columns[5]=DataGrid1.Columns[2]*DataGrid1.Columns[3]
End If

```

```
End Sub
Private Sub DataGrid1_LostFocus
Adodc2.Refresh
End Sub
VERSION 5.00
Begin VB.Form Frm_Menu
Caption="Main Menu"
ClientHeight=3195
ClientLeft=165
ClientTop=735
ClientWidth=6195
LinkTopic="Form2"
ScaleHeight=3195
Scale width=6195
StartupPosition=3 'Window Default
Begin VB.PictureBox Picture1
Appearance=0 'Flat
AutoRedraw=-1 'true
AutoSize=-1 'True
BackColor=&H80000005&
ForeColor=&H80000008&
Height=2655
Left=120
Picture="frm_menu.frx":0000
ScaleHeight=2625
Scale Width=4440
TabIndex=0
Top=600
Width=4470
End
Begin VB.Menu proj
Caption="Population Projections"
Begin VB.Menu linear
Caption="Linear Method Of Computation"
End
Begin VB.Menu Multi
Caption="Multiple Regression Observation Entry"
End
Begin VB.Menu mat_dis
Caption="Matrix Display"
End
End
Begin VB.Menu reps
Caption="Reports"
End
Begin VB.Menu sys_eqn
```

```
Caption="Multiple Regression System Of Eqn"  
End  
Begin VB.Menu Mult_reg1  
Caption="Multiple Regression[1]"  
End  
Begin VB.Menu Mult_reg2  
Caption="Multiple Regression[2]"  
End  
Begin VB.Menu lin_tab  
Caption="Linear Table"  
End  
End  
Begin VB.Menu exit  
Caption="Exit"  
End  
End  
Attribute VB_NAME="Frm_menu"  
Attribute VB_GlobalNameSpace=False  
Attribute VB_Creatable=False  
Attribute VB_Predeclared=True  
Attribute VB_Exposed=False  
Private Sub exit_Click()  
Close  
End  
End Sub  
Private Sub lin_tab_Click()  
frm_linear_Tab.Show  
End Sub  
Private Sub lin_pre_Click()  
frm_linear_pre.Show  
End Sub  
Private Sub linear_Click()  
frm_linear.Show  
End Sub  
Private Sub mat_dis_Click()  
frm_reduce.Show  
End Sub  
Private Sub multi_reg1_Click()  
frm_multi_reg1.Show  
End Sub  
Private Sub multi_reg2_Click()  
frm_multi_reg2.Show  
End Sub  
Private Sub multi_Click()  
frm_multi.Show  
End Sub
```

```
Private Sub sys_eqn_Click[]
frm_sys_eqn.Show
End Sub
VERSION 5.00
Object="{67397AA1-7FB1-11D0-B148-00A0C922E820}#6.0#0";"MSADODC.OCX"
Object="{CDE570A40-8B86-11D0-B3C6-
00A0C90AEA82}#1.0#0";"MSDATGRD.OCX"
Begin VB.Form Frm_multi
Caption="Multiple Regression Form"
ClientHeight=6255
ClientLeft=60
ClientTop=345
ClientWidth=8655
LinkTopic="Form1"
ScaleHeight=6255
Scale width=8655
StartupPosition=3 'Window Default
Begin VB.CommandButton Command 3
Caption= "Delete Current Rec"
Height=255
Left=6120
TabIndex=7
Top=4080
Width=1695
END
Begin VB.CommandButton Command 2
Caption="Close"
Height=255
Left=4680
TabIndex=6
Top=4140
Width=855
END
Begin MSDataGridLib.DataGrid DataGrid2
Bindings="frm_multi.frx":0000
Height=1575
Left=120
TabIndex=3
Top=4560
Width=6855
_ExtentX=12091
_ExtentY=2778
_Version=393216
AllowUpdate=0 'False
HeadLines=1
RowHeight=15
```



```
FormatLocked=-1 'True
BeginProperty Column01
ColumnWidth=1065.26
EndProperty
BeginProperty Column02
ColumnWidth=1065.26
EndProperty
BeginProperty Column03
ColumnWidth=1065.26
EndProperty
BeginProperty Column04
ColumnWidth=1065.26
EndProperty
BeginProperty Column05
ColumnWidth=1065.26
EndProperty
EndProperty
End
Begin VB.TextBox Text1
DataField="birth_s"
DataSource="Adodc2"
Height=285
Left=120
TabIndex=2
Text="Text1"
Top=3840
Visible=0 'False
Width=855
End
Begin MSAdodcLib.Adodc Adodc3
Height=330
Left=5640
Top=3720
Visible=0 'False
Width=2055
_ExtentX=3625
_ExtentY=582
ConnectMode=0
CursorLocation=3
IsolationLevel=-1
ConnectionTimeout=15
CommandTimeout=30
CursorType=3
LockType=3
CommandType=2
CursorOptions=0
```

```
CacheSize=50
MaxRecord=0
BOF Action=0
EOF Action=0
ConnectionStringType=3
Appearance=1
BackColor=-2147483643
ForeColor=-2147483640
Orientation=0
Enabled=-1
Connect="DSN=population"
OLEDBString=""
OLEDBFile=""
DataSourceName="population"
OtherAttributes=""
UserName=""
Password=""
RecordSource="Matrix_tab"
Caption="Adodc3"
BeginProperty Font{0BE35203-8F91-11CE-9DE3-00AA004BB851}
Name="MS OR ADEBISI"
size=8.25
Charset=0
Weight=400
Underline=0 'False
Italic=0 'False
Stikethrough=0 'False
ENDProperty
_Version=393216
End
Begin VB.CommandButton Command 1
Caption="Process System Of Equation"
Height=315
Left=1800
TabIndex=1
Top=4080
Width=2535
End
Begin MSAdodcLib.Adodc Adodc2
Height=375
Left=720
Top=3720
Visible=0 'False
Width=1815
_ExtentX=3201
_ExtentY=661
```

ConnectMode=0
CursorLocation=3
IsolationLevel=-1
ConnectionTimeout=15
CommandTimeout=30
CursorType=3
LockType=3
CommandType=1
CursorOptions=0
CacheSize=50
MaxRecord=0
BOF Action=0
EOF Action=0
ConnectionStringType=3
Appearance=1
BackColor=-2147483643
ForeColor=-2147483640
Orientation=0
Enabled=-1
Connect="DSN=population"
OLEDBString=""
OLEDBFile=""
DataSourceName="population"
OtherAttributes=""
UserName=""
Password=""
RecordSource="\$"frm_multi.frx":0015
Caption="Summation set"
Begin MSDataGridLib.DataGrid DataGrid1
Bindings="frm_multi.frx":01DF
Height=3375
Left=120
TabIndex=0
Top=360
Width=9615
_ExtentX=16960
_ExtentY=5953
_Version=393216
AllowUpdate=-1 'True
HeadLines=1
RowHeight=15
FormatLocked=-1 'True
AllowAddNew=-1 'True
AllowDelete=-1 'True
Attribute VB_Name="Frm_multi"
Attribute VB_GlobalNameSpace=False

```

Attribute VB_Creatable=False
Attribute VB_PredeclaredId=True
Attribute VB_Exposed=False
Option Base 1
Private Sub Command1_Click[]
Dim col1_val As Single.col2_val As Single.col3_val As Single.col4_val As
Single.col5_val As Single.col_sum_val As Single
Dim rec_no As Integer
On Error Resume Next
Adodc3.CommandType=adCmdText
Adodc3.RecordSource="Select from matrix_tab"
Adodc3.Refresh
If Adodc3.Recordset.RecordCount>=0 Then
Do While Not Adodc3.Recordset.EOF
Adodc3.Refresh
Adodc3.Recordset.Delete
Adodc3.Recordset.MoveNext
Adodc3.Refresh
Loop
Adodc3.Refresh
End If
Adodc1.Recordset.MoveFirst
rec_no=Adodc1.Recordset.RecordCount
Print rec_no
'wait
Adodc3.Recordset.AddNew 'row 1 entry
With Adodc3.Recordset
!col1=rec_no/1000000
!col2=Adodc2.Recordset!birth_s'/1000000
!col3=Adodc2.Recordset!death_s'/1000000
!col4=Adodc2.Recordset!emig_s'/1000000
!col5=Adodc2.Recordset!imig_s'/1000000
!sum_col=Adodc2.Recordset!pop_s'/1000000
Update
End With
Adodc3.Recordset.AddNew 'row 2 entries
With Adodc3.Recordset
!col1=Adodc2.Recordset!birth_s'/1000000
!col2=Adodc2.Recordset!b_sq_s'/1000000
!col3=Adodc2.Recordset!*1*2_s'/1000000
!col4=Adodc2.Recordset!*1*3_s'/1000000
!col5=Adodc2.Recordset!*1*4_s'/1000000
!sum_col=Adodc2.Recordset!*1_s'/1000000
Update
End With
Adodc3.Recordset.AddNew 'row 3 entries

```

```

With Adodc3.Recordset
!col1=Adodc2.Recordset!emig_s'/1000000
!col2=Adodc2.Recordset!*1*3_s'/1000000
!col3=Adodc2.Recordset!*2*3_s'/1000000
!col4=Adodc2.Recordset!e_sq_s'/1000000
!col5=Adodc2.Recordset!*3*4_s'/1000000
!sum_col=Adodc2.Recordset!y*3_s'/1000000
Update
End With
Adodc3.Recordset.AddNew 'row 5 entries
With Adodc3.Recordset
!col1=Adodc2.Recordset!imig_s'/1000000
!col2=Adodc2.Recordset!*1*4_s'/1000000
!col3=Adodc2.Recordset!*2*4_s'/1000000
!col4=Adodc2.Recordset!*3*4_s'/1000000
!col5=Adodc2.Recordset!i_sq_s'/1000000
!sum_col=Adodc2.Recordset!y*4_s'/1000000
Update
End With
End Sub
Private Sub Command2_Click[]
frm_multi.Hide
End Sub
Private Sub Command3_Click[]
If Not Adodc1.Recordset.EOF Then
Adodc1.Recordset.Delete[adAffectCurrent]
Adodc1.Recordset.MoveFirst
Adodc1.Refresh
DataGrid1.SetFocus
DataGrid1.Refresh
End If
End Sub
Private Sub DataGrid1_GotFocus[]
DataGrid1.Refresh
End Sub
Private Sub DataGrid1_KeyPress[KeyAscii As Integer]
On Error Resume Next
If KeyAscii=13 Then
If DataGrid1.Col=2 Then
'DataGrid1.Columns[3]=DataGrid1.Columns[3]/1000000
DataGrid1.Columns[7]=DataGrid1.Columns[3]^2
End If
If DataGrid1.Col=4 Then DataGrid1.Columns[8]=DataGrid1.Columns[4]^2
If DataGrid1.Col=5 Then DataGrid1.Columns[9]=DataGrid1.Columns[5]^2
'compute the multiplication of columns
DataGrid1.Columns[10]=DataGrid1.Columns[1]^2 'y square column

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```
DataGrid1.Columns[11]=DataGrid1.Columns[2]*DataGrid1.Columns[3]
DataGrid1.Columns[12]=DataGrid1.Columns[2]*DataGrid1.Columns[4]
DataGrid1.Columns[13]=DataGrid1.Columns[2]*DataGrid1.Columns[5]
DataGrid1.Columns[14]=DataGrid1.Columns[3]*DataGrid1.Columns[4]
DataGrid1.Columns[15]=DataGrid1.Columns[3]*DataGrid1.Columns[5]
DataGrid1.Columns[16]=DataGrid1.Columns[4]*DataGrid1.Columns[5]
DataGrid1.Columns[17]=DataGrid1.Columns[1]*DataGrid1.Columns[2]
DataGrid1.Columns[18]=DataGrid1.Columns[1]*DataGrid1.Columns[3]
DataGrid1.Columns[19]=DataGrid1.Columns[1]*DataGrid1.Columns[4]
DataGrid1.Columns[20]=DataGrid1.Columns[1]*DataGrid1.Columns[5]
End If
End If
End Sub
VERSION 5.00
Begin VB.Form Frm_multi_rep
Caption="Form1"
ClientHeight=3195
ClientLeft=60
ClientTop=345
ClientWidth=4680
LinkTopic="Form1"
ScaleHeight=3195
Scale width=4680
StartupPosition=3 'Window Default
Begin VB.CommandButton Command1
Caption= "Process"
Height=375
Left=1320
TabIndex=0
Top=2040
Width=1455
End
End
Attribute VB_NAME="Frm_multi_rep"
Attribute VB_GlobalNameSpace=False
Attribute VB_Creatable=False
Attribute VB_Predeclared=True
Attribute VB_Exposed=False
Private Sub Command1_Click[]
dta_multi.Show
End Sub
VERSION 5.00
Begin VB.Form Frm_multi_rep2
Caption="multiple regression report2"
ClientHeight=3195
ClientLeft=60
```

```
ClientTop=345
ClientWidth=4680
LinkTopic="Form1"
ScaleHeight=3195
Scale width=4680
StartUpPosition=3 'Window Default
Begin VB.CommandButton Command1
Caption= "Process"
Height=615
Left=1200
TabIndex=1
Top=2160
Width=1575
End
Begin VB.Label Label1
Caption="multiple regression [Part2]"
Attribute VB_NAME="Frm_multi_rep2"
Attribute VB_GlobalNameSpace=False
Attribute VB_Creatable=False
Attribute VB_Predeclared=True
Attribute VB_Exposed=False
Private Sub Command1_Click[]
dta_multi_rep2.Show
End Sub
Begin MSAdodcLib.Adodc Adodc1
Height=375
Left=3360
Top=3360
Visible=0 'False
Width=1575
ExtentX=2778
ExtentY=661
ConnectMode=0
CursorLocation=3
IsolationLevel=-1
ConnectionTimeout=15
CommandTimeout=30
CursorType=3
LockType=3
CommandType=2
CursorOptions=0
CacheSize=50
MaxRecord=0
BOF Action=0
EOF Action=0
ConnectionStringType=3
```

```
Appearance=1
BackColor=-2147483643
ForeColor=-2147483640
Orientation=0
Enabled=-1
Connect="DSN=population"
OLEDBString=""
OLEDBFile=""
DataSourceName="population"
OtherAttributes=""
UserName=""
Password=""
RecordSource="$Matrix_tab"
Caption="Adodc1"
BeginProperty Font{0BE35203-8F91-11CE-9DE3-00AA004BB851}
Name="MS OR ADEBISI"
size=8.25
Charset=0
Weight=400
Underline=0 'False
Italic=0 'False
Stikethrough=0 'False
EndProperty
_Version=393216
End
Begin VB.CommandButton Command 1
Caption="Compute"
Height=255
Left=1320
TabIndex=0
Top=4080
Width=1815
End
Begin VB.Label Label5
BorderStyle=1 'Fixed Single
Caption="Label5"
Height=255
Left=1080
TabIndex=15
Top=2040
Width=1335
End
Begin VB.Label Label4
BorderStyle=1 'Fixed Single
Caption="Label4"
Height=255
```



```
Left=1080
TabIndex=14
Top=1560
Width=1335
End
Begin VB.Label Label3
BorderStyle=1 'Fixed Single
Caption="Label3"
Height=255
Left=1080
TabIndex=13
Top=1080
Width=1335
End
Begin VB.Label Label2
BorderStyle=1 'Fixed Single
Caption="Label2"
Height=255
Left=1080
TabIndex=12
Top=600
Width=1335
End
Begin VB.Label Label1
Caption="Enter Parameter for Computation"
Height=255
Left=240
TabIndex=11
Top=240
Width=2655
End
Begin VB.Label Label6
BorderStyle=1 'Fixed Single
Caption=""
ForeColor=&H8000000D&
Height=375
Left=3960
TabIndex=6
Top=2760
Width=2175
End
Begin VB.Label lbl_esr
BorderStyle=1 'Fixed Single
Caption="Estimated Population"
ForeColor=&H8000000D&
Height=495
```

```
Left=2640
TabIndex=5
Top=2640
Width=1215
End
Begin VB.Label lbl_I
BorderStyle=1 'Fixed Single
Caption="Immigrants[X4]"
Height=255
Left=2640
TabIndex=4
Top=2040
Width=1215
End
Begin VB.Label lbl_E
BorderStyle=1 'Fixed Single
Caption="Emigrant[X3]"
Height=255
Left=2640
TabIndex=3
Top=1560
Width=1215
End
Begin VB.Label lbl_d
BorderStyle=1 'Fixed Single
Caption="Deaths[X2]"
Height=255
Left=2640
TabIndex=2
Top=1080
Width=1215
End
Begin VB.Label lbl_b
BorderStyle=1 'Fixed Single
Caption="Births[X1]"
Height=255
Left=2640
TabIndex=1
Top=600
Width=1215
End
End
Attribute VB_NAME="Frm_reduce"
Attribute VB_GlobalNameSpace=False
Attribute VB_Creatable=False
Attribute VB_Predeclared=True
```

```

Attribute VB_Exposed=False
Dim ini_array[5,5] As Single
Dim array1[5,5] As Single, sum_array[5,3] As Single
Dim array3[3,3] As Single, j As Integer, k As Integer, comm_val As Single
Dim or_det As Double, det1 As Double, det2 As Double, det3 As Double, det4 As
Double, det5 As Double
Private Sub Command1_Click()
Adodc1.CommandType=adCmdText
Adodc1.RecordSource="select*from matrix_tab"
Adodc1.Refresh
Adodc1.Recordset.MoveFirst
j=1
k=1
Do While Not Adodc1.Recordset.EOF 'populate the first matrix array
array1[j,1]=Adodc1.Recordset!col1
ini_array[j,1]=Adodc1.Recordset!col1
sum_array[j,1]=Adodc1.Recordset!sum_col
array1[j,2]=Adodc1.Recordset!col2
ini_array[j,2]=Adodc1.Recordset!col2
array1[j,3]=Adodc1.Recordset!col3
ini_array[j,3]=Adodc1.Recordset!col3
array1[j,4]=Adodc1.Recordset!col4
ini_array[j,4]=Adodc1.Recordset!col4
array1[j,5]=Adodc1.Recordset!col5
ini_array[j,5]=Adodc1.Recordset!col5
j=j+1
Adodc1.Recordset.MoveNext
Loop
first_det=matrix
call the matrix function
For m=1 To 5 'iterate for the number of determinants
For j=1 To 5 'initialise the array1 with initial matrix data
For k=1 To 5
If m=k Then
array1[j,k]=sum_array[j,1]
'Print sum_array[j]
Else
array1[j,k]=ini_array[j,k]
End If
Next k
Next j
'Print
'Print
sum_array[m,2]=matrix
'For j=1 To 5

```

```

'Print array1[j,1] & "I" & ARRAY1[J,2] & "I" & ARRAY1[J,3] & "I" & ARRAY1[J,4]
&"I" & ARRAY1[J,5]
Next j
'Print matrix & "determinant" & m
Next m
'Print first_det & " first determinant"
Dim est_pop As Double
est_pop=first_det
For w=1 To 5 ' colthree stores the original det/by each determinant
sum_array[w,3]=sum_array[w,2]/first_det
'Print sum_array[w,2] & " ";sum_array[w,3]
est_pop=est_pop+sum_array[w,3]
Next w
Label2.Caption=det1
Label3.Caption=det2
Label4.Caption=det3
Label5.Caption=det4
'Printest_pop & "estimated population"
If Not IsNumeric[Text1.Text] Or Not IsNumeric[Text2.Text] Or Not
IsNumeric[Text3.Text]
Or Not IsNumeric[Text4.Text] Then
MsgBox["Complete Your Entries Please!"]
Text1.SetFocus
Else
est_pop=CSng[Text1.Text]+ [CSng[Text1.Text] * sum_array[1,3]]+
[CSng[Text2.Text] * sum_array[2,3]]+
[CSng[Text3.Text] * sum_array[3,3]]+ [CSng[Text4.Text] * sum_array[4,3]]
Label6.Caption=est_pop
End If
'Print
Cls
'Print
'For j=1 To 5
'Print ini_array[j,1] & "I" & ini_ARRAY1[J,2] & "I" & ini_ARRAY1[J,3] & "I" &
ini_ARRAY1[J,4] & "I" & ini_ARRAY1[J,5]
'Next j
'Print
End Sub
Private Function Matrix[]
For j=1 To 5 'loop for the rows to reduce from 5 by 5 to 4 by 4
comm_val=array1[j,1]
For k=1 To 5
If j=1 Then
array1[j,k]=array1[j,k]/ comm_val
End If
Ifj<>1 Then

```

```

array1[j,k]=array1[j,k]-comm_val
End If
Next k
Next j
'Print "Processed 5 by 5"
'For j=1 To 5
'Print array1[j,1] & "I" & ARRAY1[J,2] & "I" & ARRAY1[J,3] & "I" & ARRAY1[J,4]
&"I" & ARRAY1[J,5]
'Next j
'Print
'Print
'populate the second array matrix
Dim j1 As Integer,k2 As Integer
j1=1
k1=1
For j=2 To 5
For k=2 To 5
array2[j1,k1]=array1[j,k]
k1=k1+1
Next k
j1=j1+1
k1=1
Next j
'Print "matrix 4 by 4 unprocessed"
'Print
For j1=1 To 4
'Print array2[j1,1] & "I" & ARRAY2[J1,2] & "I" & ARRAY2[J1,3] & "I" &
ARRAY2[J1,4]
'Next j1
For j=1 To 4 'loop for the rows to compute and reduce from 5 by 5 to 4 by 4
comm_val=array2[j,1]
Print comm_val
For k=1 To 4
If j=1 Then
array2[j,k]=array2[j,k]/comm_val
End If
If j<>1 Then
array2[j,k]=array2[j,k]-comm_val
End If
Next k
Next j
'Print
'Print "the 4 by 4 matrix processed"
For j1=1 To 4
'Print array2[j1,1] & "I" & ARRAY2[J1,2] & "I" & ARRAY2[J1,3] & "I" &
ARRAY2[J1,4]

```

```

'Next j1
'populate the third array
Dim j1 As Integer,k2 As Integer
j1=1
k1=1
For j=2 To 4
For k=2 To 4
array3[j1,k1]=array3[j,k]
k1=k1+1
Next k
j1=j1+1
k1=1
Next j
'Print
'0 Print " 3 by 3 unprocessed"
For j2=1 To 3
'Print array3[j2,1] & "I" & ARRAY3[J2,2] & "I" & ARRAY3[J2,3]
'Next j2
'process the 3 by 3 matrix
Dim val1 As Double, val2 As Double, val3 As Double,
val1=array3[1,1]*[[array3[2,2]*array3[3,3]]-[array3[2,3]*array3[2,2]]]
val1=array3[1,2]*[[array3[2,1]*array3[3,3]]-[array3[2,3]*array3[3,1]]]
val1=array3[1,3]*[[array3[2,1]*array3[3,2]]-[array3[2,2]*array3[3,1]]]
or_det=val1-val2+val3
matrix=or_det
End Function
VERSION 5.00
Object="{67397AA1-7FB1-11D0-B148-00A0C922E820}#6.0#0";"MSADODC.OCX"
Begin VB.Form Frm_sys_eqn
Caption="Form1"
ClientHeight=3195
ClientLeft=60
ClientTop=345
ClientWidth=4680
LinkTopic="Form1"
ScaleHeight=3195
Scale width=4680
StartupPosition=3 'Windows Default
Begin MSAdodcLib.Adodc Adodc1
Height=375
Left=480
Top=2040
Width=2775
_ExtentX=4895
_ExtentY=661
ConnectMode=0

```

```
CursorLocation=3
IsolationLevel=-1
ConnectionTimeout=15
CommandTimeout=30
CursorType=3
LockType=3
CommandType=2
CursorOptions=0
CacheSize=50
MaxRecord=0
BOF Action=0
EOF Action=0
ConnectionStringType=3
Appearance=1
BackColor=-2147483643
ForeColor=-2147483640
Orientation=0
Enabled=-1
Connect="DSN=population"
OLEDBString=""
OLEDBFile=""
DataSourceName="population"
OtherAttributes=""
UserName=""
Password=""
RecordSource="Matrix_tab"
Caption="Adodc1"
BeginProperty Font{0BE35203-8F91-11CE-9DE3-00AA004BB851}
Name="MS OR ADEBISI"
size=8.25
Charset=0
Weight=400
Underline=0 'False
Italic=0 'False
Stikethrough=0 'False
EndProperty
_Version=393216
End
Begin VB.CommandButton cmd_process
Caption="process"
Height=255
Left=1440
TabIndex=1
Top=2520
Width=1575
End
```

```
Begin VB.Label Label1
Caption="System Of Equation Report"
Height=375
Left=720
TabIndex=0
Top=120
Width=2775
End
End
```

```
Attribute VB_NAME="Frm_sys_eqn"
Attribute VB_GlobalNameSpace=False
Attribute VB_Creatable=False
Attribute VB_Predeclared=True
Attribute VB_Exposed=False
Private Sub cmd_process_Click[]
Adodc1.CommandType=adCmdText
Adodc1.dta_sys_eqn.DataSource= Adodc1
dta_sys_eqn.Show
End Sub
```

VERSION 5.00

```
Begin VB.Form Frm_line_pre
Caption="line prediction"
ClientHeight=3195
ClientLeft=60
ClientTop=345
ClientWidth=4680
LinkTopic="Form1"
ScaleHeight=3195
Scale width=4680
StartupPosition=3 'Windows Default
```

```
Begin VB.CommandButton Command1
Caption="Process"
Height=255
Left=960
TabIndex=0
Top=2280
Width=1695
End
```

```
Begin VB.Label Label1
Caption="linear Prediction"
BeginProperty Font{0BE35203-8F91-11CE-9DE3-00AA004BB851}
Name="MS OR ADEBISI"
```



```
size=13.5
Charset=0
Weight=700
Underline=0 'False
Italic=0 'False
Stikethrough=0 'False
ENDProperty
Height=375
Left=840
TabIndex=1
Top=240
Width=3255
End
End
```

```
Attribute VB_NAME="Frm_line_pre"
Attribute VB_GlobalNameSpace=False
Attribute VB_Creatable=False
Attribute VB_Predeclared=True
Attribute VB_Exposed=False
Private Sub cmd_process_Click[]
dta_line_pre.Show
End Sub
```

```
VERSION 5.00
Begin VB.Form Frm_Linear_Tab
Caption="Form1"
ClientHeight=3195
ClientLeft=60
ClientTop=345
ClientWidth=4680
LinkTopic="Form1"
ScaleHeight=3195
Scale width=4680
StartupPosition=3 'Windows Default
```

```
Begin VB.CommandButton Command 1
Caption="Process"
Height=495
Left=1080
TabIndex=0
Top=2040
Width=1695
End
```

```
Begin VB.Label Label1
```

Caption="Linear Table[Time Series Analysis]"

Attribute VB_NAME="Linear_Tab"

Attribute VB_GlobalNameSpace=False

Attribute VB_Creatable=False

Attribute VB_Predeclared=True

Attribute VB_Exposed=False

Private Sub Command1_Click[]

dta_linear.Show

End Sub

SAMPLE OUTPUT

PROJECTED POPULATION FIGURE FOR KADUNA STATE

YEAR	POPULATION
1992	4,063,801
1993	4,196,159
1994	4,332,827
1995	4,473,948
1996	4,619,824
1997	4,770,126
1998	4,797,155
1999	4,944,078
2000	5,097,492
2001	5,254,179

KADUNA SOUTH LOCAL GOVT. POPULATION FIGURE

LOCALITY	POPULATION
K/Mashi	2,002,639
Tudun Nupawa	39,311
Badikko	16,265
Anguwan Sanusi	23,971
Sabon Gari	55,588
Tudun Wada	60,299
Kabala West/Umuazu	37,713
Kakuri Makera	77,374
Barnawa	32,684
Ung Television	28,344

MALE - FEMALE POPULATION IN KADUNA SOUTH L.G.A

LOCALITY	MALE	FEMALE
K/Mashi	10,573	9,453
Tudun Nupawa	21,124	18,187
Badikko	9,092	7,173
Anguwan Sanusi	12,512	11,459
Sabon Gari	29,421	26,167
Tudun Wada	31,199	29,100
Kabala West/Umuazu	19,596	18,117
Kakuri Makera	41,540	35,834
Barnawa	17,553	15,131
Ung Television	14,783	13,561

DERIVED POPULATION FIGURE COMPARED WITH PROJECTED FIGURE

YEAR	Y	X
1991	21865	20026
1992	22521	20702
1993	23197	21378
1994	23893	22054
1995	24610	22730
1996	25348	23406

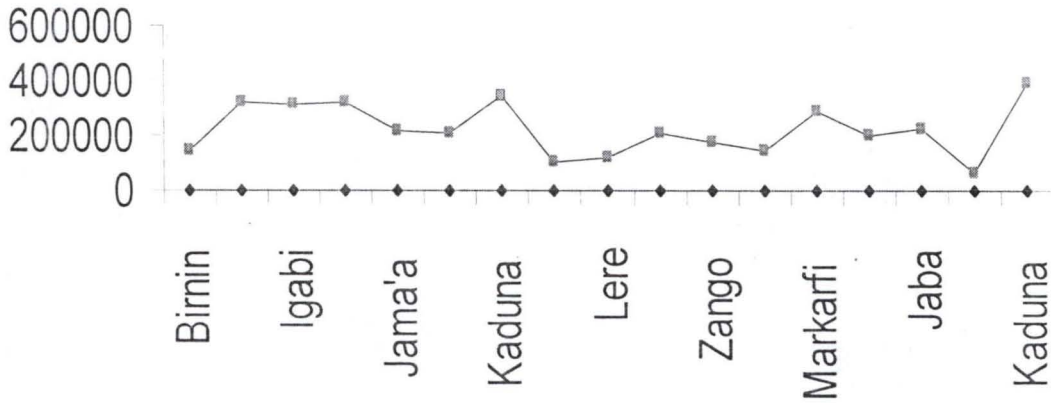
PREDICTED POPULATION ESTIMATE

YEAR	PREDICTED ESTIMATE
1991	25,348
1992	26,118
1993	26,912
1994	27,730
1995	28,573
1996	29,441

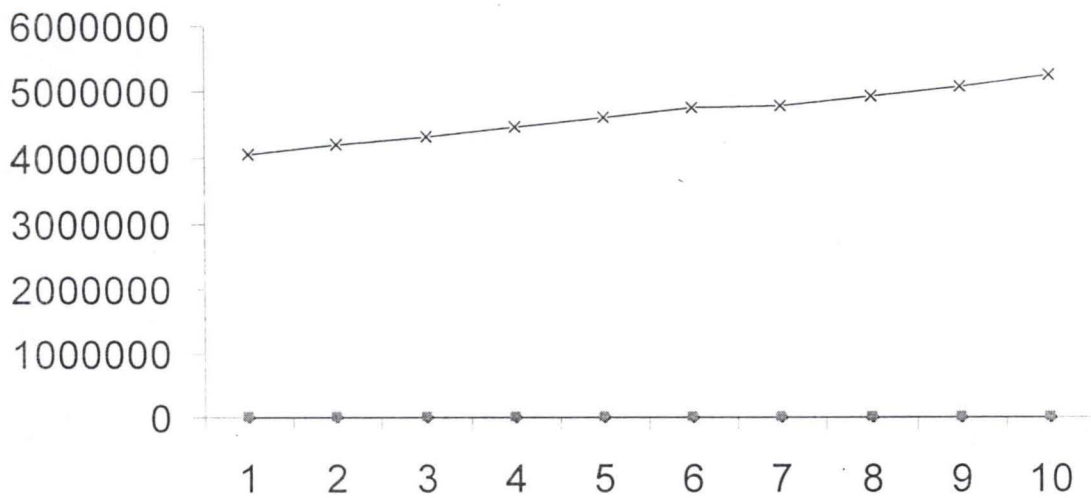
TIME SERIES ANALYSIS

YEAR	Y	X	X2	XY	Y2
1991	2.1865	-5	23	-10.9325	4.7808
1992	2.2521	-4	16	-9.0084	5.072
1993	2.3197	-3	9	-6.9591	5.301
1994	2.3893	-2	4	-4.7786	5.7088
1995	2.461	-1	1	-2.461	6.0565
1996	2.5348	0	0	0	6.4252
1997	2.6118	-1	1	2.6118	6.8215
1998	2.6912	-2	4	5.3824	7.2456
1999	2.7730	-3	9	8.319	7.6895
2000	2.8573	-4	16	11.4292	8.1642
2001	2.9441	-5	25	14.7205	8.6677
TOTAL	28.0208	0	110	8.3233	72.0097

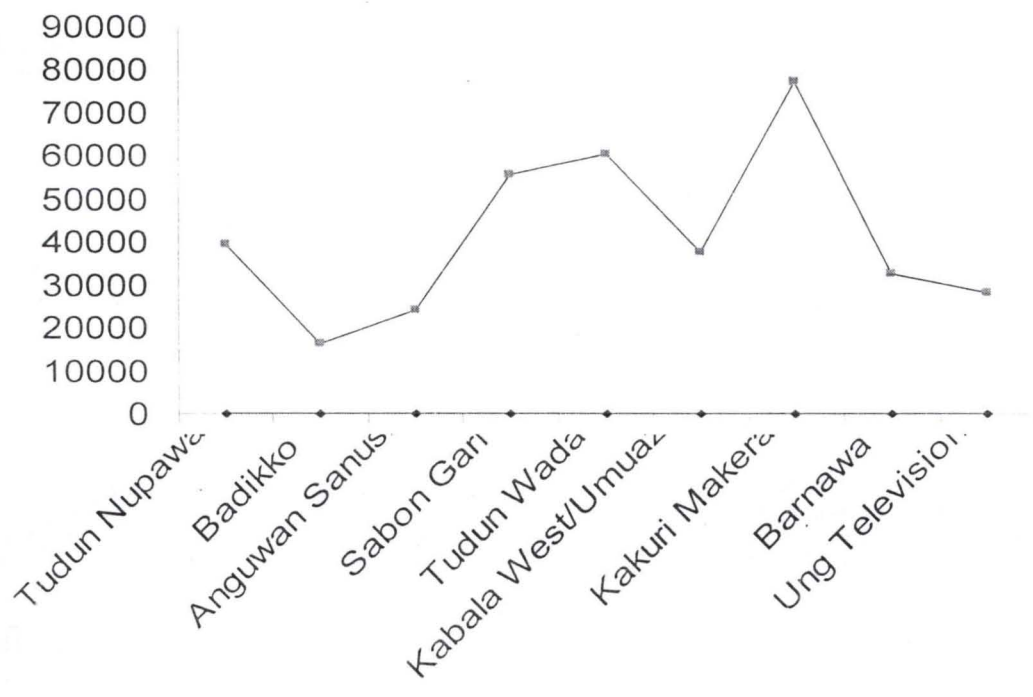
**SCATTERED POPULATION FOR
KADUNA STATE
FIGURE 1**



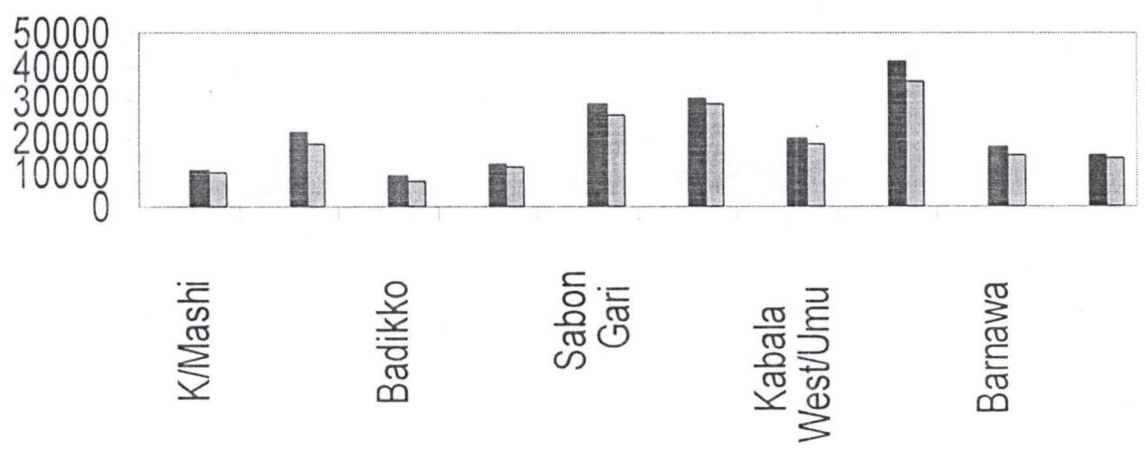
**SCATTERED DIAGRAM OF
PROJECTED POPULATION FOR
KADUNA STATE
1992 - 2001
FIGURE 2**



SCATTERED DIAGRAM OF KADUNA SOUTH LOCAL GOVT. POPULATION FIGURE
FIGURE 3



BAR CHART SHOWING MALE-FEMALE POPULATION IN KADUNA SOUTH LOCAL GOVT. AREA
FIGURE 4



DERIVED POPULATION FIGURE COMPARED
WITH PROJECTED FIGURE 1991 - 1996
FIGURE 5

