URBAN BUS TRANSPORTATION IN İZMİR:

“SYNCHRONIZATION OF TIMETABLES & COST ANALYSIS OF ESHOT”

BURAK BALTACI

JANUARY 2007

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Approval of the Graduate School of Social Sciences

_____
Prof. Dr. Tunçdan BALTACIOĞLU
Director

I certify that this thesis satisfies all the requirements as a thesis for the degree of Master of Science.

_____
Prof. Dr. Tunçdan BALTACIOĞLU
Head of Department

This is to certify that we have read this thesis and that in our opinion it is fully adequate, in scope and quality, as a thesis for the degree of Master of Science.

_____
Prof. Dr. Tunçdan BALTACIOĞLU
Supervisor

Examining Committee Members

Prof. Dr. Tunçdan BALTACIOĞLU _____

Prof Dr. Frank BATES _____

Doç. Dr. Okan TUNA _____

ABSTRACT

URBAN BUS TRANSPORTATION IN İZMİR:

"SYNCHRONIZATION OF TIMETABLES & COST ANALYSIS OF ESHOT"

Baltacı, Burak

Logistics Management, Graduate School of Social Sciences

Supervisor: Prof. Dr. Tunçdan BALTACIOĞLU

JANUARY 2007

This thesis is written to increase the efficiency and profitability of the urban transportation activities of Eshot in İzmir. A mathematical optimization model created by the writer was used to improve urban transportation activities. One of the objectives of the model is to minimize the operating costs of the total number of trips assigned to all routes while satisfying passenger demand during a given period of the day. The other objective is to synchronize and re-design the bus timetables to shorten the waiting times of the customers at the bus stops. The efficiency of this model, compared to optimal solutions, is illustrated through a series of solutions and examples.

Keywords: Urban Transportation Planning & Synchronization of Timetables

ÖZET

İZMİR'DE YEREL OTOBÜS ULAŞIMI:

"ZAMAN ÇİZELGELERİNİN TEKRAR DİZAYNI & ESHOT MALİYET ANALİZİ"

Baltacı, Burak

Lojistik Yönetimi Yüksek Lisans

Tez Yoneticisi: Prof. Dr. Tunçdan BALTACIOĞLU

OCAK 2007

Bu çalışma, İzmir ilinde kentsel ulaşım faaliyetlerini yürüten Eshot firmasının karlılığını ve verimliliğini arttırmak için yazılmıştır. Kentsel ulaşım aktivitelerinin geliştirilmesi için yazar tarafından yaratılan matematiksel optimizayon modeli kullanıldı. Bu modelin amaçlarından birincisi, firmanın çalıştırma maliyetlerini düşürüp, müşteri memnuniyetini arttırmak; diğer amacı ise otobüslerin hareket çizelgelerini modifiye edip, gerekirse tekrar düzenleyip, müşterilerin duraklardaki bekleme sürelerini azaltmaktır. Modelin verimliliği, çözümlerle ve bir dizi örneklerle gösterilmektedir.

Anahtar Kelimeler: Kentsel ulaşım planlaması ve zaman çizelgelerinin tekrar düzenlenmesi.

To my family & to my love,

ACKNOWLEDGMENTS

First of all, I would like to thank to my family, especially to my grandmother, for their spiritual support. I wish to express my all thanks for their holly assistance in the compilation and reproduction of this work.

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INTRODUCTION

Our existence in time is determined for us, but we are largely free to select our location. (Losch, 1954)

Transportation is one of the main concepts of our daily life. To continue their survival, people have to change locations steadily. From the past to current day, it became easier and faster for people to change locations with the help of of new technologies and developments.

Upon the invention of horse-drawn and then electric streetcars, “streetcar suburbs” quickly arose along newly laid tracks. Following World War II, widespread construction of express highways had a similar but even stronger effect, especially in the U.S. causing development to spread more ubiquitously because automobiles relaxed the need for proximity to a transit line. These developments provided many desired amenities to residents, but also created problems. (Small 1995)

Whereas it took weeks, months or years to travel between two different regions in the past, it takes hours or minutes nowadays.

In today’s world, the location changing activites between places are mostly made by various kinds of vehicles. People use cars, buses, trains, planes, ships and other kinds of vehicles to travel between cities, countries and continents. When different regions of the world are photographed by satellites from the space, the movement activities of millions of people and millions of vehicles could be noticed. Especially the high levels of traffic density in urban areas may draw attention. The higher levels of population in urban areas brings higher levels of traffic density which can be seen as one of the most important problems in a city.

The defining trait of urban areas is density: of people, activities, and structures. The defining trait of urban transportation is the ability to cope with this density while moving people and goods. Density creates challenges for urban transportation because of crowding and the expense of providing infrastructure in built-up areas. It also creates certain advantages because of economies of scale: some transportation activities are cheaper when carried out in large volumes. These characteristics mean that two of the most important phenomena in urban transportation are traffic congestion and mass transit. (Small 1995)

To develop solutions for “traffic problem”, local and state governments produced various ideas and projects; “transportation planning” concept was born. Transportation planning is a cooperative effort between different units of local, state and federal government with opportunities for citizen input and participation. (Beimbom, 1995)

Governments and citizens have to work cooperatively on “traffic problem”. The tools of transportation planning concept may involve modifying transportation infrastructure of urban areas, modernizing and developing the used mass transportation systems and increasing the comparative advantage of using mass transportation systems. Citizens have to be tempted to use mass transportation vehicles instead of using their private vehicles and by this way, the number of vehicles moving in traffic will be lowered.

If governments want to direct and orient citizens to use mass transportation systems, they have to increase the advantages of using mass transportation systems. There are some points that government agents has to work on

seriously to effect customers positively. Firstly, governments and corporations (giving mass transportation service), must work on improving the service quality given to customers. Secondly, the price adjustments have to be made because pricing is always an important factor on decision-making. Lastly, the corporations giving mass transportation service have to be inspected and audited continualy.

If the service quality of mass transportation systems are high and if the pricing strategy of governments and corporations are acceptable, it will be easier to tempt people to use public transportation systems. At this point, the terms of “pricing strategy” and “service quality” have to be mentioed clearly.

Pricing is directly related with total costs of the activities. To continue its activities and to give always the higher quality of service, a corporation has to make enough profit. To make profit, the company has to be managed by professional experts who are following correct strategies and doing the right decision makings.

Service quality refers to comfortibality, safety and reliability of the company. The vehicle fleet being used in mass transportation activities have to be modern and the drivers using vehicles have to be expertised. For a customer, except values like comfortibality, safety and reliability, another important point is the “time” factor. Vehicles have to arrive and depart always in time because nobody wants to wait at stops for the delays. Mass transportation systems have to be managed with efficient time-tables. This detail is important for corporations because it’s affecting costomer’s decision-making process.

The subjects mentioned above are valid and authoritative in many developed countries of the world, also in Turkey. Facing with the traffic problem in every moment of our life in Turkey, government agents developed and applied many policies but most of them were unable to bring permanent solutions. With the effect of increasing population of Turkey, the infrastructure of metropols are not facing the total demands and needs of citizens. High levels of traffic density is a part of daily life of citizens, espacially in 3 important metropols of Turkey, İstanbul, Ankara and İzmir.

In this thesis, the traffic density in İzmir is chosen as a subject. To decrease the traffic density level in İzmir, one choice is to decrease the number of cars moving in the traffic. It will be unable to decrease the number of people changing locations every day, so the solution will be tempting citizens to use mass transportation system. . The evaluation of mass transportation activities in İzmir is selected as the general subject of this paper.

All the mass transportation organization in İzmir is managed by İzmir City Hall. There are four companies giving mass transportation service, Eshot and İzulaş in highway transportation, Metro in subway transportation and İzdeniz in sea transportation. The activities of Eshot and İzulaş will be evaluated by analyzing the total number of passengers carried in a randomly selected single weekday by current fleet of the companies.

By using the mathematical model, this study aims to evaluate the companies mass transportation activitity performances. There will be two steps to make this analysis: the first step is comparing the Eshot's and İzulaş's fleet usage rates with the rates that the mathematical optimization model gave; and the second step is evaluating the total operating costs.

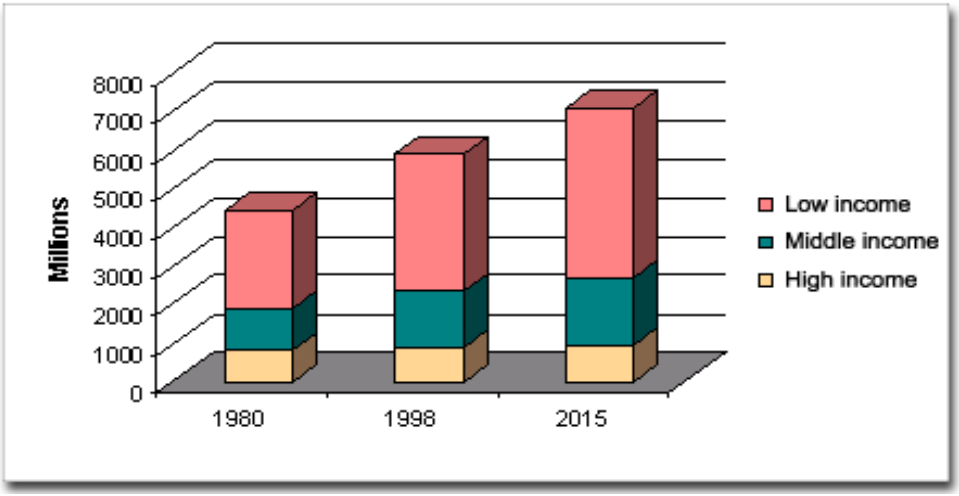
These study will help the local bus companies in synchronizing the time-tables they are using. While doing the first step, the model will also give the most effective schedules that have to be used; so it will be also possible to reschedule the bus time-tables.

CHAPTER–1: INFORMATION & OBJECTIVES

1.1 Effects of Population and Migration on Urban Transportation:

In the glossary of the "World Bank", Population growth rate (PGR) is described as the increase in a country's population during a period of time, usually one year, expressed as a percentage of the population at the start of that period [1]. It reflects the number of births and deaths during the period and the number of people migrating to and from a country.

The specialists in the World Bank have made a research about the world's Population Growth Rate (PGR) between years 1980 and 2015. The results of this research are shown in the Figure-1 below.



Figure–1: Total World Population by Country Income Group, 1980, 1998, 2015

(Source: http://www.worldbank.org/depweb/english/modules/social/pgr/chart1.html; January 2007)

[1] Source: " http://www.worldbank.org/depweb/english/modules/social/pgr/print.html ; January 2007)

While the x-axis of the Figure–1 represents the years, the y-axis of the Figure–1 represents the total population of the world. The colored bars are segmented due to the income levels of the citizens.

Between 1980 and 2000 total world population grew from 4,4 billion to 6 billion. Based on population projections, by 2015 at least another billion people will be added for a total of more than 7 billion. Most of this growth will take place in low- and middle-income countries.

Following this research, TİSK (Türkiye İşveren Sendikaları Kurumu – Union of Emplyer Association) had made *a research* [2] about the same subject and reported that Turkey will be the third country after India and Ireland in the Population Growth Rate tables. The average PGR of the world is 1,1%, while PGR of Turkey is 1,2%.

As it can be reflected in the analysis, PGR of Turkey is one of the highest in the world. The increase in the population causes changes in the social-economic indicators; for example icrease in the unemployment rate, decrease in the Gross Domestic Product (GDP) and incrase in the migration from less-developed agriculturist regions of the Turkey to more developed industrialist regions of Turkey.

According to the researches of DIE (Devlet İstatistik Enstitüsü – Turkish Statistical Institute), the most industrialist cities of Turkey are İstanbul, Ankara and İzmir. In 2000, DIE had made a statistical research and stated the *Rates of Migration of each city in Turkey* [3]*.* İstanbul, İzmir and Ankara are the first three cities respectively, if the list is lined due to the highest net migration to the least.

[2] Source: " http://www.tisk.org.tr/yayinlar.asp?sbj=ic&id=142 ; January 2007
[3] Source: " http://www.tuik.gov.tr/PreIstatistikTablo.do?istab_id=187 ; January 2007

Net residence in 2000	In Migration	Out Migration	Net Migration	Rate of net migration %
9.044.859,00	920.955,00	513.507,00	407.448,00	46,09

Table–1: The rate of migration for İstanbul

Net residence in 2000	In Migration	Out Migration	Net Migration	Rate of net migration %
3.078.981,00	306.387,00	186.012,00	120.375,00	39,88

Table–2: The rate of migration for İzmir

Net residence in 2000	In Migration	Out Migration	Net Migration	Rate of net migration %
3.597.662,00	377.108,00	286.224,00	90.884,00	25,59

Table–3: The rate of migration for Ankara

These researches shows why İzmir is getting crowded each year. The increase in the number of citizens living in İzmir causes increases in the number of households needed, in the needs of more shopping centers and parks, in the number of cars moving in the traffic, etc. Although more examples can be given about the effects of the increasing population, I don't have to do that; because I've found what I'm looking, "The main reason of the traffic problem in İzmir: increasing population".

Transportation is an important term for all developing cities. Transportation can be seen in each part of our life. In order to continue their lifes, people oftenly change their locations during daytimes. People go to work, they go to shopping centers, they turn back to their homes, they go to cinemas, they go on holidays...

Like people do, other non-living objects are also changing locations. Let's think of a TV. After it is produced, it's been taken to a warehouse. Then, it has been taken to the shop where it is going to be put in the display window. Then, someone cames and buys the TV and takes it to his house. This is a small transportation cycle for a TV.

For all these kinds of transportation activities, people use motorized and unmotorized vehicles like automobiles, ships, vessels, planes, trains, bycles and etc. The movement of motorized and unmutorized vehicles can be also called as "traffic". In the traffic, two types of vehicles may be seen; public transportation vehicles and citizen's private vehicles.

1.2 Policies for Effective Urban Transportation:

In highly-populated cities like İzmir, the traffic activites are also high. Most of the time, especially in weekends and in rush hours, the number of total vehicles in the moving in traffic go beyond the current infrastructure capacity of İzmir. Because of the non-running traffic, citizens tries alternative ways of transportation, such as using public transportation vehicles instead of using their private transportation vehicles.

At this point, two main ideas have to be set up and accepted:

1) The most rationalistic policy to lower the traffic density in weekends and rush hours will be to persuade citizens using public transportation vehicles instead of using their private vehicles. This will also lower the environmental pollution because lesser number of vehicles will burn up fuel and gasoline which was very dangerous for the atmosphere according to some researches made by ministries of countries related with environment protection and environment protection organizations. (Granberg, 2002)

According to a research made in Connecticut in 1974, The Connecticut Department of Environmental Protection has estimated that about 98 per cent of carbon monoxide emissions, 93 per cent of hydrocarbon emissions and 39 per cent of nitrogen oxide emission are caused by motor vehicles, about 90 per cent of which are cars in Connecticut. (CONNECTICUT PUBLIC EXPENDITURE COUNCIL, 1974)

2) To support the first policy, corporations and association responsible for the public transportation organizations had to give perfect levels of service to citizens. In other words, the prices of tickets should be cheap; the vehicles should be safe, new and comfortable; and the vehicles should travel the distances just in time, no waiting time for the citizens in stations.

When I match these two policies with the ones currently applied in İzmir, it's not difficult two see the exact differences between my ideal policy and the policies being applied now. I, as a citizen of Turkey living in İzmir, want the transportation system to perform the two policies I've set above because I want cheaper, safer, and comfortable transportation; nobody wants to wait a bus for an hour.

1.3 Transportation Modes in İzmir:

In İzmir there are three transportation modes being used actively. Highway, rail and sea routes are used in public transportation. The İzmir Büyükşehir Belediyesi (City Hall of İzmir) are controlling and organizing all the transportation activities under its supervision.

In highway transportation, there are two corporations, Eshot and İzulaş, organizing public transportation activities inside İzmir. İzulaş is the smaller corporation and it is semi-privately established. All operational activities

made by İzulaş is controlled by Eshot's management. Eshot is directly owned by the City Hall of İzmir. In sea transportation, İzdeniz is the authorised corporation and directly established and controlled by the City Hall. In railway-subway transportation, Metro is the corporation organizing the public transportation activities and like Eshot and İzdeniz, it's completely owned and controlled by the City Hall of İzmir.

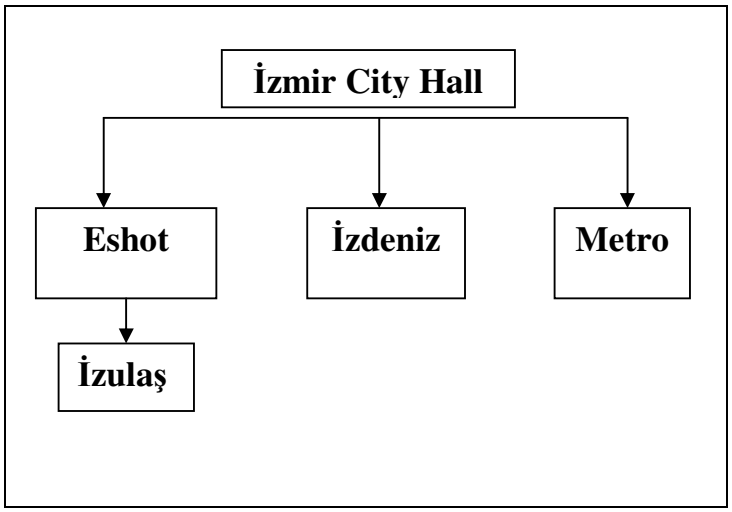


Figure-2: The Management Cycle of the Corporations organizing the public transportation activities in İzmir. [4]

If you are a citizen in İzmir, you can use any of these public transportation vehicles by using a smart card, named "Kent Kart" [5]. Firstly, you have to buy the card and then you have to install an amount of money as a credit inside the memory of the card. Then you are able to use that smart card in all of the

[4] The figure is sketched to clarify the administrative relationships between corporations of government in Turkey.
[5] City Hall of İzmir had created the "Kent Kart" project in 15.03.1999.

public transportation vehicles. When your credit inside the card is finished, you have to re-install it in one of the stations.

By using a smart card system, The City Hall of İzmir and the corporations managing the transportation activities are able to evaluate many kinds of statistical datas like “the total number of passengers transported”, “the total kilometres made by each vehicle”, and “the efficiency of each route”. These are some of the examples of the statistical datas and they are really important for a kind of big transportation organization to set its performance levels and evaluate each corporation’s success or failure.

When I contacted with the information desk in City Hall of İzmir, I’ve taken all the datas I’ve needed to work on my thesis. I’ve used the database of the smart card. The first data I needed is the “total number of passengers transported in a year” because I’ve to see the percentage of total passengers transported by each transportation modes. In Table–4, the company names, the transportation modes, the total number of passengers transported in 2005 and the percentage of total passengers by which transportation mode they are using can be seen.

In Table–4, highway transportation is the mode used mostly in İzmir with a ratio of 63,41% for Eshot and 24,68% for İzulaş and 88,09% in total. Railway-Subway transportation is in 7,94% density whereas sea transportation is in 3,97% density. Highway transportation is the dominant mode.

Company Name	Transportation Mode	Total # of Passengers Transported in 2005	% of Total Passengers
ESHOT	*Highway*	217.878.803	63,41%
IZULAS	*Highway*	84.807.700	24,68%
METRO	*Rail*	27.268.654	7,94%
İZDENİZ	*Sea*	13.642.709	3,97%
	Total	**343.597.866**	**100%**

Table–4: Total Passengers transported in izmir in 2005

(Source: " http://www.eshot.gov.tr/f-sayisal_profil.htm ; January 2007)

All the public transportation activities on higways inside the city borders of İzmir is organized and operated by ESHOT, which is completely established under the supervision of İzmir Büyükşehir Belediyesi. There are currently defined 282 different routes inside the city borders. ESHOT has 5 main depots allocated in strategic points. All buses begin their service day from an assigned depot and return at the conclusion of the day to that depot. Each bus is assigned with two drivers; each driver is using the bus for 9 hours a day.

When I analyze the local bus transportation system of İzmir, I've faced with four major problems. One of them is the disharmony in the total trip numbers on some popular routes. The other problem is the ambiquity in the bus-timetables. The next problem I've faced is the low quality service levels. The last problem is the high dead-costs of the buses. I determine these problems and develop a model that will analyze all the datas taken from "Eshot

Headquarters Office" and makes the possible corrections in the local bus transportation system.

1.4 Objectives of the Model:

"What should be the frequency of the departures of buses from depots in order to minimize the waiting times of passengers waiting at the bus stops?" and "can we decrease the total costs and can we increase the efficiency of the bus company by rescheduling the timetables?" are the two important questions that will be solved by the model.

In the model I created, there are two major targets I've set. First one is decreasing the costs of the local bus company, while increasing the efficiency of the fleet and thus, maximizing the customer's satisfaction. Second one is rescheduling the bus-timetables to harmonize the total trips made during a day-time.

The solution of these critical points will also help me to solve the traffic problem in the long-term, especially in rush hours (06.00–08.59 and 18.00–20.59) when the passenger amounts being carried hits maximum.

In Figure–3 illustrated below, the passenger density on buslines in İzmir at different hours of a day can be examined. The graphics is drawn with the help of the datas taken from City Hall. It doesn't reflect the exact ratios but it's nearly to similar.

The x-axis shows the hours of a day and the y-axis shows the number of passengers carried at specific times of a day. When the data coming from the "smart card storage system" are observed and watch the traffic density in İzmir, it's easily seen that at the weekdays, the morning time between 06.00–08.59 and the evening time between 18.00–20.59 are the times when

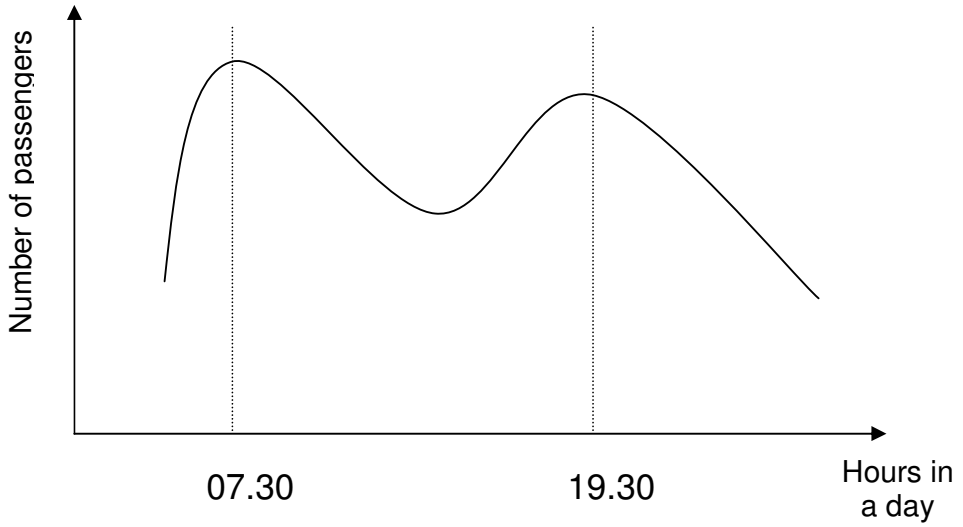


Figure-3: Passenger density in a daytime

customer's demands reach at maximum. In mornings, people go to work and school and in the evenings, same people turn back their homes. It's a repetitious situation in weekdays and causes a boom in the demand of public transportation vehicles. 07.30 and 19.30 hours in the graphic represents the average hours in each time-period selected.

CHAPTER 2: BACKGROUND

2.1 Urban Transportation: A Historical Look

As İzmir is one of the largest and crowded cities of Turkey, it's getting bigger and bigger each day. The current infrastructure in city doesn't correspond the basic needs and expectations. There is a uncontrollable growth in İzmir and this situation causes many problems in basic concepts like householding, employment and transportation.

In history, these kinds of problems were always seen in cities that were growing because of the increasing population. When the U.S. Census Bureau's historical national population estimates are examined, the incrase in the overall population within twenty years time between 1940 and 1960 can be viewed in *Table–5*.

Date	National Population	Population Change	Average Annual % Change
1940, 1 July	132.122.446		
1945, 1 July	139.928.165	7.805.719	5,91%
1950, 1 July	152.271.417	12.343.252	8,82%
1955, 1 July	165.931.202	13.659.785	8,97%
1960, 1 July	180.671.158	14.739.956	8,88%

Table–5: The Historical National Population Estimates in the U.S between 1940 and 1960.

(Source: " http://www.census.gov/popest/archives/1990s/popclockest.txt ; January 2007)

In Table–5, the first column represents the dates when the estimations are made. In second column, the number of the total population are given and the third column shows the net changes in time. In the forth column, the average annual changes are represented in percentages.

The critical point is the years between 1940 and 1945 because those were the period of World War II. The effect of the war on population can be seen from the average annual change. (Sternlieh & Hughes, 1986).

After the World War II was finished, the population started to increase with a ratio of 8,90% approximately for fifteen years time. These increase in population brought the need to expand the infrastructure of the states and cities in the U.S. In many of the basic concepts of daily life, such as householding, employment and transportation, U.S. government started to make restorations and new investments. The new regulations and new projects on “Transportation” concept in the U.S were started to be built-up in those years. (Weiner, 1992)

In March 1962 a joint report on “Urban Mass Transportation” was submitted to President Kennedy, at his request, by the Secretary of Commerce and the Housing and Home Finance Administrator (U.S. Congress, Senate, 1962). The report strongly recommended that urban transportation was a federal concern and supported the need for transportation planning. The report explains the importance of the "Urban Transportation” concept and the policies that have to be urgently implemented:

> "Transportation is one of the key factors in shaping our cities. As our communities increasingly undertake deliberate measures to guide their development and renewal, we must be sure that transportation planning and construction are integral parts of general development planning and programming. One of our main recommendations is that federal aid for urban transportation should be made available only when urban communities have

prepared or are actively preparing up-to-date general plans for the entire urban area which relate transportation plans to land-use and development plans.

"The major objectives of urban transportation policy are the achievement of sound land-use patterns, the assurance of transportation facilities for all segments of the population, the improvement of overall traffic flow, and the meeting of total transportation needs at minimum cost. Only a balanced transportation system can attain these goals - and in many urban areas this means an extensive mass transportation network fully integrated with the highway and street system.

But mass transportation in recent years experienced capital consumption rather than expansion. A cycle of fare increases and service cuts to offset loss of ridership followed by further declines in use points clearly to the need for a substantial contribution of public funds to support needed mass transportation improvements. We therefore recommend a new program of grants and loans for urban mass transportation" (U.S. Congress, Senate, 1962).

In the United States, urban transportation planning was carried out primarily by state and local agencies. Over the years, much experience had been gained in the planning and evaluation of urban transportation systems. That knowledge was useful to planners and decision makers in the development and implementation of transportation system changes. The role of the federal

government had been to set national policy, provide financial aid, supply technical assistance and training, and conduct research.

Following the report on “Urban Mass Transportation”, in April 1962, President Kennedy delivered his first message to Congress on the subject of transportation. The President's message recognized the close relationship between the community development and the need to properly balance the use of private automobiles and mass transportation to help shape and serve urban areas. It also recognized the need to promote economic efficiency of urban areas. (Weiner, 1992)

This transportation message opened a new era in urban transportation and led to passage of two landmark pieces of legislation: the Federal-Aid Highway Act of 1962 and the Urban Mass Transportation Act of 1964.

The Federal-Aid Highway Act of 1962 was the first piece of federal legislation to mandate urban transportation planning as a condition for receiving federal funds in urbanized areas. It’s expressed in the act that federal concern in urban transportation was to be integrated with land development and provided a major stimulus to urban transportation planning. The importance of planning the urban transportation is mentioned as:

> "It is declared to be in the national interest to encourage and promote the development of transportation systems embracing various modes of transport in a manner that will serve the states and local communities efficiently and effectively" (U.S. Dept. of Transportation, 1980).

The U.S. Bureau of Public Roads (BPR) moved quickly to implement the planning requirements of the 1962 Federal-Aid Highway Act. The BPR

interpreted the act's provisions related to a "continuing, comprehensive, and cooperative" (3C) planning process. "Cooperative" was defined to include not only cooperation between the federal, state, and local levels of government but also among the various agencies within the same level of government. "Continuing" referred to the need to periodically reevaluate and update a transportation plan. "Comprehensive" was defined to include the basic ten elements of a *3C planning process* (see Figure-x) for which inventories and analyses were required. (Weiner, 1992)

The BPR defined the various steps in a 3C planning process. It was an empirical approach which required a substantial amount of data and several years to complete. The process consisted of: establishing an organization to carry out the planning process; development of local goals and objectives; surveys and inventories of existing conditions and facilities; analyses of current conditions and calibration of forecasting techniques; forecasting of future activity and travel; evaluation of alternative transportation networks resulting in a recommended transportation plan; staging of the transportation plan; and identification of resources to implement it. The product of the 3C planning studies was generally an elaborate report(s) describing the procedures, analyses, alternatives and recommended plans.

These studies are the keystones that were showing us the importance of “transportation planning”.

The 3C planning process (Figure–4) was a leading study for most of the studies made on public transportation.

TEN BASIC ELEMENTS OF A 3C PLANNING PROCESS

1. Economic factors affecting development
2. Population
3. Land use
4. Transportation facilities including those for mass transportation
5. Travel patterns
6. Terminal and transfer facilities
7. Traffic control features
8. Zoning ordinances, subdivision regulations, building codes, etc.
9. Financial resources
10. Social and community-value factors, such as preservation of open space, parks and recreational facilities; preservation of historical sites and buildings; environmental amenities; and aesthetics.

Figure–4: The basic elements of the transportation planning process

(Source: "Weiner, Edward, *Urban Transportation Planning in the U.S.- An Historical Overview*, Nov.1992, pg. 45")

With the regulation of new policies, government in the United States, supported and subsidized the urban transportation systems in 1960's and 1970's. The companies in the sector were trying to encourage citizens to use mass transportation vehicles. More customers may or may not mean a profit, depending on whether it takes lower fares, more service, more imaginative

promotion, restrictions on auto travel or some combination of these to increase the number of mass transportation customers. Due to the help of the government, the public transit companies started losing their customers and losing money. There are many reasons that can be listed, but the most important reason is: “cars”. (Weiner, 1992)

To strengthen this hypothesis, Table–6 and Table–7 illustrated below, should be examined.

	Population in Connecticut	# of Cars in Connecticut
1960	2.106.412	687.496
1970	3.062.528	1.618.641
Change %	31,21%	57,52%

Table–6: The Increase in Population and in Total Number of Cars in Connecticut between 1960’s and 1970’s.

(Source: American Transit Association, “*Bus Transportation in Connecticut: Data for Planning, Agenda for Action*”, 1974, pg.12)

According to a research (has 2 steps) made in Connecticut in the late 1970’s (the findings of the research is shown in Table–6), the increase in the number of cars registered in Connecticut in the last 20 years has far outstripped the growth rate in the State's population.

	Transport by Car	Transport by Bus	Other
1960	68%	12%	20%
1970	81%	7%	12%

Table 7: The findings of the 2nd step of the research

Second step of the research was doing a survey to evaluate the decisions of the local citizens on transportation activities. At the end of the survey, the findings were interesting because effect of the increase in the number of the cars (in Table–7) could be clearly seen on the usage of the public transportation systems. When compared with the 1960's values, the usage of the public transportation systems had fallen by 13% in total (5% decrease in Transport by Bus and 8% decrease in Other).

People didn't want to ride trains or buses when they could afford a car. Public transit systems started losing more and more money. In Los Angeles, the Pacific Electric railway shut down. Other transit operators cut services. Buses and trains weren't popular anymore. People liked cars better. (American Transit Association, 1974)

As the decade of the 1980's progressed there was a growing awareness that the public sector did not have the resources to continue providing all of the programs to which it had become committed. This was particularly true at the federal level of government. Moreover, by continuing these programs, governmental bodies were preempting areas that could be better served by the private sector. Governments and public agencies began to seek opportunities for greater participation of the private sector in the provision

and financing of urban transportation facilities and services. In addition, the federal government sought to foster increased competition in the provision of transportation services as a means to increase efficiency and reduce costs. Changes in the transportation system were intended to be the outcomes of competition in the marketplace rather than of public regulation. (Weiner, 1992)

By the early 1990's, there were major changes underway that would have significant effects on urban transportation and urban transportation planning. The era of major new highway construction was over in most urban areas. any transportation agencies entered into strategic management and planning processes to identify the scope and nature of these changes, to develop strategies to address these issues, and to better orient their organization to function in this new environment. They shifted their focus toward long-term time horizons, more integrated transportation management strategies, wider geographic application of these strategies, and a renewed interest in technological alternatives.

2.2 Similar Approaches to "Scheduling Timetables" Problem

The questions adressed here has not been dealt with extensively in the literature. There are similar mathematical approaches.

Voss (1992) formulated the problem of minimizing the waiting time of passengers at the transfer nodes as a quadratic assignment problem (QAP) as it's explained by Lawler (1963) and Hillier and Connors (1996). His study refers to the cases where each bus route, *i*, is jointed by a set, *n(*i), of possible departure times.

Desilet and Rousseau (1992) describe a different model, which selects a starting time for each route from a set of possible starting times, *T*. The objective function is to minimize the total penalty associated with transfers from line *i* to line j, for each *i* and *j*.

Dagonzo (1990) presented the problem of the coordination of a network comprising only one node, at which inbound and outbound routes intersect. In addition, Lee and Schonfeld (1991) attempted to synchronize one bus route with a rail line while assuming stochastic conditions. Their conclusion was that there was no justification for synchronization for situations characterized by highly arrival times. Following those approaches, Chin and Schonfeld (1998) tried to optimize the overall costs while integrating the schedule of a rail line and its feeding buses, and also showing the complexity of their problem. (Ceder, Golany, Tal, 2001)

In 2001, Keith A. explored the development of a mixed integer programming (MIP) optimization model to determine the best number, location, and size of transit centers to serve an existing (or planned) network of transit routes. The development of a mathematical model to assist in transit center location decision is explored for the buses and route network of the Vancouver (Canada) Regional Transit System, owned and operated by British Transit (BC). (Willoughby 2001)

Transit centers are described as facilities where buses are housed and various maintenance activities performed. In their model, all buses begin their service day from an assigned transit center and return at the conclusion of the day to that depot. The largest cost associated with bus garage location

involves the “deadheading” of buses to their assigned routes. The same criteria are also valid for Eshot’s model.

The determination of the optimal number, size, and location of “facilities” to serve a base of “customers” is one of a class of problems known as location/allocation problems. Cooper was an early contributor and examined applications as warehouses, audit offices and ambulance centers. (Willoughby 2001)

Finally, Ceder, Golany and Tall (2001) created a model, which enables transit schedulers on the headways for each route, to introduce different frequencies for every route, and to apply other constraints. Their purpose was to establish a useful scheduler’s tool for synchronization through treating the scheduler’s tool for synchronization in a mathematical fashion. The objective function of their model was to maximize the number of simultaneous bus arrivals in the network. They provided two mathematical formulations of the problem – a nonlinear programming and a mixed integer linear programming.

The model that was created by Cedar, Golany and Tall was a leading one for my thesis. My model will calculate the optimum number of buses that have to be used to meet the demand at anytime of the day and find the frequency of the departures of buses for each route. In addition to their objective; in my model, the new operating costs of the companies will be calculated and compared with previous ones.

2.3 İzmir: Pearl of the Aegean Zone

As shown in Figure–5, İzmir is located on the west coast of Anatolia, in the Aegean zone. İzmir is established on the coast of a U-shaped bay, called the Izmir Bay. Once the ancient city of Smyrna (historical name of İzmir), it is

now a modern, developed, and busy commercial center, set around a huge bay and surrounded by mountains.

Figure–5: The map of Turkey (İzmir is on the west coast)

(Source: " http://images.google.com.tr/ ; January 2007)

The broad boulevards, glass-fronted buildings and modern shopping centers are dotted with traditional red-tiled roofs, the 18th century market, and old mosques and churches, although the city has an atmosphere more of Mediterranean Europe than traditional Turkey.

In Figure-6, the rectengular area shown in red represents where most of the residence live. All of the transportation routes pass through the same zone.

Figure–6: The overview of the İzmir city center.

(Source: "http://www.turkish-media.com/y_h/c1.htm; January 2007)

Izmir is a city whose population is rapidly increasing. According to the population census on 2000 made by the government, Izmir is the third biggest city in Turkey with respect to its population. The yearly population increase is 20.38 per thousand. Eighty-two per cent of the population live in urban areas whereas 18% live in rural areas. Being a hub of transport, industry, agriculture and trade, Izmir is prone to extensive immigration.

Province	Population	Employed Population	% Employed Population of Total
İstanbul	10.018.735	3.977.241	39,70%
Ankara	4.007.860	1.378.699	34,40%
İzmir	*3.370.866*	*1.436.185*	*42,61%*
Konya	2.192.166	883.838	40,32%
Bursa	2.125.140	825.531	38,85%

Table–8: Turkey's biggest cities with respect to population census made in 2000.

(Source: " http://www.tuik.gov.tr/PreIstatistikTablo.do?istab_id=298 ; January 2007")

As it can be seen in Table–8 above, İzmir is one of the most crowded cities in Turkey. In Table–8, I've added two columns that are showing the "*employed population*" and the "*% Ratio of the employed population to total population of that city*". Datas in these columns are very significant for my thesis because those datas represent the moving population in the city every weekday. When compared to other crowded cities in Turkey, İzmir is the leader in the percentages with 42,61% of its population is working and have to move every weekday. This brings an increase in the traffic density, and an increase in the number of vehicles running in the traffic.

2.4 Transportation network in Turkey:

Major public transportation infrastructure such as railways, highways, water and sewage, gas, posts, electricity generation and distribution are owned and operated by state enterprises or municipality administrations or by companies owned by them. Public utilities networks are summarized below:

Railways: State Railways Administration (TCDD - Directorate General of State Railway Administration) of the Ministry of Transportation is the owner and the operator of the railway network in Turkey. State Railways Administration controls both passenger transportation and freight. Length of the railway network is approximately 10518 km. Passenger volume is over 100 million passengers per year and freight volume is around 10 million tons per year. The railway network has a signalization network with a potential to use as an alternative network.

Highways: State Highways Administration (Directorate General of Land Transportation-KGM) of the Ministry of Transportation is the owner and the operator of the highway and road network in Turkey. State Highways Administration is equipped to do the maintenance highways and roads itself.

Ownership, operation and maintenance of roads within city boundaries belong to city municipality administrations.

There are many companies offering intercity passenger transportation. Urban transportation is provided by municipality owned bus and rail transportation companies and by licensed private enterprises.

Airway: Including THY (Türk Hava Yolları), there are many companies carrying passengers within Turkey.

Waterways: There is no waterway operation other than sea transportation in Turkey.

Seas and coastal zones: Passenger transportation in the sea is a state monopoly in Turkey granted to Sea Transportation Enterprise. Some city municipalities (i.e. Istanbul and Izmir) have special organizations (City Sea Transportation Enterprise) for passenger transportation between ports within

the city or between the city and the nearby ports. There is also small-scale private passenger transportation in Istanbul.

Freight transportation is liberalized.

2.5 Transportation Network inside Izmir:

The local transportation network in İzmir consists of 3 main parts; highway, waterway and subway. The companies working under the control of Municipality of Izmir control the public transportation system.

Two licensed public transportation facilities, Eshot and Izulas, control the highway transportation. As Eshot working in coordination with Izulaş, both companies organize many trips on pre-set trajectories (302 different bus trajectories-lines) every day with 1534 ESHOT and 573 Izulaş labeled buses that are linked to five different depots [6].

The waterway and subway transportation are good alternatives for the highway transportation inside the city. The Municipality of Izmir controls both systems. Especially, the ferries are very efficient for traveling from one side of the U-shaped Izmir bay to the other side.

For transportation within the city, public transportation facilities are available and easy to access. By purchasing a Kentkart (city-card), on which you can charge as much units (contour) as you please at the many charging kiosks (Kentkart Dolum Noktası) located around the city, you can make use of buses, ferryboats and metro (subway) trains.

2.6 Bus transportation in Izmir: An owerview of ESHOT

Eshot is a public transportation facility serving in Izmir. Eshot General Directorship, which takes active role in the urban transportation network of

[6] Source: "http://www.eshot.gov.tr ; September 2006

İzmir, is a large-scale institution established under the control of Municipality of İzmir.

Eshot's Workshops, Depots and Garages in Izmir:

Each workshop, depot or garage shown below, includes a parking area, maintanence service machinery, and a car-wash equipment. The vehicle parking capacity differs in each garage.

— Gediz *Workshop and Heavy Maintenance Plant*: This is the main facility, also including the building of the Main Operations and General Directorship.

— *İnciraltı Workshop*

— Karşıyaka *Workshop*

— Adatepe *Workshop*

— Mersinli *Garage*

— Çiğli *Garage*

In Table–9 below, we provide the size and type of the bus fleet of Eshot and Izulas. Solo-type buses are the ones which has a passenger capacity of 100 and the long-type busesare the ones which has a pasenger capacity of 150.

BUS FLEET	
TYPE	**QUANTITY**
SOLO	1080
LONG	403
DOUBLE	5
MIDIBUS	50
TOTAL	***1534***

Table–9: Bus fleet of Eshot and İzulaş

(Source: " http://www.eshot.gov.tr/e-otobus_filomuz.htm ; September 2006)

In Table–10 below, some ideas about the annual scale of the operations conducted by both companies using data's of 2005 is illustrated. The datas below show the performance of the public highway transportation companies, Eshot and İzulaş, in 2005.

DIGITAL DATA in 2005			
	ESHOT	İZULAŞ	TOTAL
# of Total Buses	1119	415	1534
Average # of Buses Working in a day	975	378	1353
# of Total Trips made	2.730.341	1.067.444	3.797.785
# of Total Routes	286		
Total KM in 2005	73.130.146	33.108.184	106.238.330
Number of Total Bus Stops	3481		

Table–10: Data's from 2005.

(Source: " http://www.eshot.gov.tr/f-sayisal_profil.htm ; September 2006)

In Table–10, the most conspicuous point is the difference between the "number of total buses" and the "average number of buses working in a day-time". Total number of buses is 1534 and the average number of buses working i a day-time is 1353. There is a difference of 181 buses. This explains that 11,07% (181/1534) of the total number of buses are used as a stock. Working with a 11,07% stock ratio will be an acceptable decesion, but it doesn't change the truth that the excess number of buses generates a huge maintenance cost and it have to be decreased.

CHAPTER–3: THE MODEL

As fully mentioned in Chapter-2, what I exactly want to do is increasing the efficiency and the profitability of the local bus companies. The bus companies will give better service to citizens and will tempt them to use public transportation vehicles more instead of using private vehicles for urban transportation.

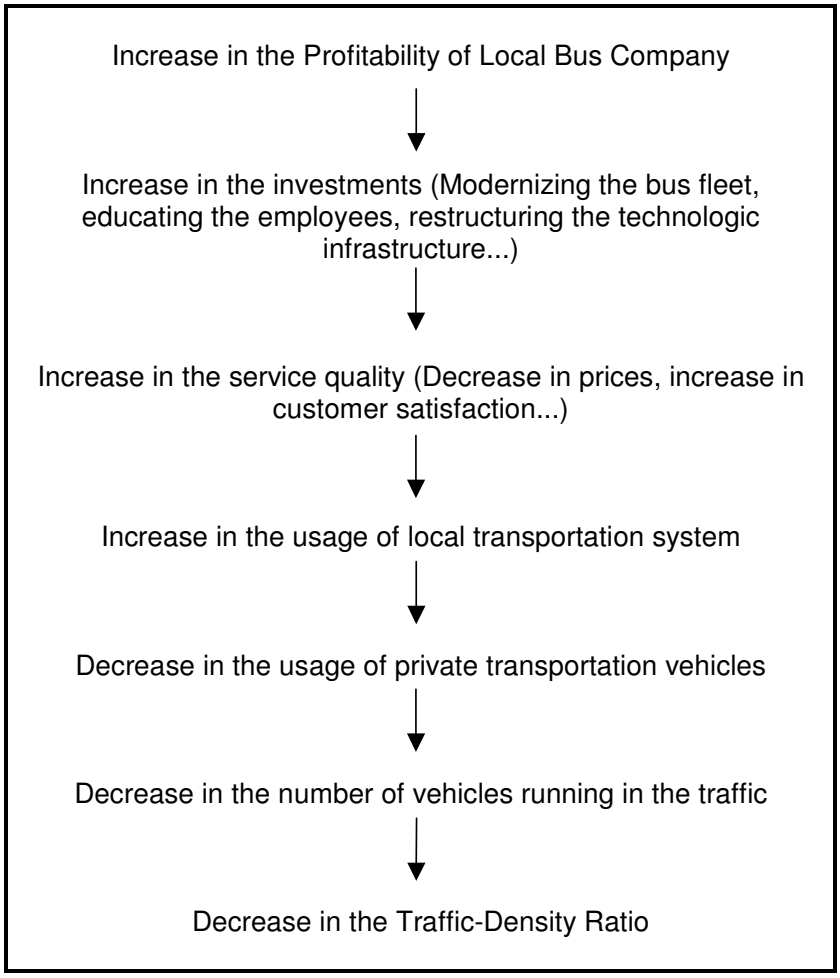


Figure-7: The “affection and reaction cycle” in public transportation

All these effects have a positive reaction on decreasing the traffic-density in İzmir. These “affection and reaction cycle” illustrated in Figure-7, will also work in other cities where there is a highly increased traffic-density ratio.

Public transit systems, by virtue of their network design and substantial costs, would appear to represent a fruitful are for mathematical modeling. (Willoughby 2001)

Models are important because transportation plans and investments are based on what the models say about future travel. Models are used to estimate the number of trips that will be made on a transportation systems alternative at some future date. (Beimbom 1995)

Taking all the factors into consideration, I’ve designed the bus route assignment problem, which has been modeled as Problem P given below.

The definitions required in the mathematical model are given as follows:

Problem P:

(0) Minimize $\Sigma_{r,k}\ dis_r\ Q_k\ x_{rk}$

subject to:

1) $demand_r \leq \Sigma_k\ cap_k\ x_{rk}$ $\forall r$

2) $\Sigma_r\ x_{rk} \leq\ 4\ E_k$ $\forall k$

3) $\Sigma_k\ x_{rk} \geq\ demand_r / avg\_cap$ $\forall r$

4) $\Sigma_k\ x_{rk} \geq 2$ $\forall r$

5) positive integer x_{rk}

Definitions:

x_{rk} : Number of trips of type k assigned to route r

Q_k : Operating cost per km. for trip of type k

Dis_r : Distance (km.) of route r

$Demand_r$: Expected number of passengers in route r during a given period of the day

Cap_k : Passenger capacity of bus type k

E_k : Number of buses available of type k

Avg_cap: average capacity over all bus types k: $\Sigma_k cap_k/K$

In Problem P, the objective is to minimize the operating costs of the total number of trips assigned to all routes while satisfying passenger demand during a given period of the day. Here, the day is divided to 5 periods, each of 3 hours, starting from 06.00 to 20.59. The periods are: 1) 06.00–08.59, 2) 09.00–11.59, 3) 12.00–14.59, 4) 15.00–17.59, 5) 18.00–20.59. The period number 1 and the period number 5 are the most important ones in the model because those periods are the ones that maximum amount of passengers are carried on.

The operating cost is given by km. travelled during a trip and it includes maintenance, driver fee, deadheading (from its allocated depot to first bus stop on its route) and fuel costs.

The first constraint (Constraint 1) ensures that the total trip capacity assigned to a route is sufficient to carry the total expected number of passengers during a given period of the day (e.g., morning rush hour).

The second constraint (Constraint 2) limits the total alllocated number of trips during a period of the day by the available number of buses of a given type. Since given periods of the day cover 3 hours, it is assumed that a bus allocated to a route during that period can make maximum 4 trips, that is, a trip per approximately 45 min. This assumption is made reliably since the

longest travel time during a rush hour lasts at most 45 minutes when all routes in the city are considered.

The third constraint (Constraint 3) places an approximate lower bound on the number of trips assigned to a route by using the ratio of expected number of passengers during a given period of the day to average capacity of a trip calculated over all trip types.

The last constraint (Constraint 4) assures that at least one trip is assigned to a route every 90 minutes. Finally, the number of trips assigned to each route during a given period of the day must take integral values.

Taking the four constraints in consideration, the model I've created is installed into GAMS which is a high-level modeling system for optimization. The unknown values will be taken from Eshot's "Kent Kart Database" (the smartcard used as a ticket) and will be used as inputs; by this way, the problem will be solved.

CHAPTER–4: IMPLEMENTATION OF THE MODEL

4.1 Data Used in the Implementation of the Model:

In Table-11, the data taken directly from Eshot are partially shown due to issues of confidentiality. As expressed in Chapter-2, all of the data needed to solve the model were taken from the Eshot Smart Card Database System with a special permission taken from General Manager of Eshot; thus the reliability of the data is very high.

In the first column of Table-11, trajectory ids are shown. In the second column of the Table-11, the directions of the trajectory are given. A bus works as a ring system on the same route in both directions throughout the day. In column three, the zones express the starting points of the buses. It means that there are five depots. Eshot buses are located in Izmir. In the fourth column, the trajectory names can be seen. In fifth column, the length between the starting point and the finishing point of the trajectory are given. In column six, the numbers of the buses used by Eshot to meet the demand in every trajectory is shown. In column seven, the number of the trips made in each route during a weekday is given. Finally, in the last column, numbers of the passengers transported (Demand) are shown.

In Table-12, passenger's density on a randomly chosen weekday (Wednesday in our model) is given. Wednesday is chosen because it's the mid-day of the weekdays. There are seven time periods in 24 hours time; but in the model's solution process, the periods of 00.00-05.59 and 21.00-23.59 will not be included because of the minimal number of passengers carried. Also, in those periods, the traffic density is too low; thus, solutions of those periods do not affect the general solution.

For each time period, numbers of the passengers transported are shown. As the total number of passenger transported in 24 hours time is known, a passenger density number can be calculated by dividing the total number of passengers by number of passengers in each time period.

This set of data has been obtained for a randomly chosen weekday in January 2006. The optimal value of each unknown variable defined below in Table-11 and Table-12 can be found.

Line No	Direction	Zone	Route	Distance (Km.)	Vehicle Used	Trip No.	Passenger No.
5	Departure	Teleferik	*F.ALTAY - İNÖNÜ CD. - VARYANT*	17.400	5	47	2128
	Arrival					47	2175
27	Departure	Merkez	*KARABAĞLAR - VARYANT*	8.000	3	52	875
	Arrival					51	1035
46	Departure	Buca	*LEVENT-KEMER-BASMANE*	9.150	8	76	2111
	Arrival					74	2192
63	Departure	Bornova	*MANAVKUYU - ADLİYE - MONTRÖ*	16350	16	109	4607
	Arrival					101	3821
600	Departure	Karşıyaka	*ALTINYOL - YEŞİLDERE - İNÖNÜ CD.*	23.500	7	62	3160
	Arrival					62	2964

Table-11: "Sample: Randomly chosen rows from the main data taken from Eshot"

Passenger Density On A Randomly Chosen Weekday	
Time Periods	**Passenger No.**
00:00-05:59	57,413
06:00-08:59	212,469
09:00-11:59	142,044
12:00-14:59	168,075
15:00-17:59	168,895
18:00-20:59	98,185
21:00-23:59	28,462

Table-12: This table shows the transported passenger's density on a randomly chosen weekday.

4.2 Software Used in the Interpretation of the Model, GAMS[7]:

The General Algebraic Modeling System (GAMS) is a high-level modeling system for mathematical programming and optimization. It consists of a language compiler and a stable of integrated high-performance solvers. GAMS is tailored for complex, large scale modeling applications, and allows you to build large maintainable models that can be adapted quickly to new situations.

GAMS lets the user concentrate on modeling. By eliminating the need to think about purely technical machine-specific problems such as address calculations, storage assignments, subroutine linkage, and input-output and flow control, GAMS increases the time available for conceptualizing and running the model, and analyzing the results. GAMS structures good modeling habits itself by requiring concise and exact specification of entities and relationships. The GAMS language is formally similar to commonly used programming languages. It is therefore familiar to anyone with programming experience.

Using GAMS, data are entered only once in familiar list and table form. Models are described in concise algebraic statements, which are easy for both humans and machines to read. Whole sets of closely related constraints are entered in one statement. GAMS automatically generates each constraint equation, and lets the user make exceptions in cases where generality is not desired. Statements in models can be reused without having to change the algebra when other instances of the same or related problems arise. The location and type of errors are pinpointed before a solution is attempted. GAMS handles dynamic models involving time sequences, lags and leads and treatment of temporal endpoints.

[7] Source: "http://www.gams.com/ ; September 2006"

CHAPTER–5: RESULTS & BENEFITS OF THE MODEL

The model has been implemented to generate the trip allocation and corresponding bus schedules of each line in Izmir during 5 periods of the day. For each period, a separate table is presented in the Appendix that shows the line identity (first column), the number of one-way trips allocated to the line generated by the optimal solution to the model (second column), the number of buses of each type (third and fourth columns) that can accomplish this number of trips during the given period of the day (this calculation is based on the time required to traverse the route and the number of hours in the considered period), and the corresponding frequency of buses (last column) on that route (180 min./total number of allocated trips).

While allocating the number of buses required to accomplish a given number of trips on a line, it's assumed that if the distance of the route is less than 7.5 km., then a bus can travel one way on the line in a maximum duration of 30 minutes. For longer distance routes, it's allocated an hour for one-way trip. These are based on the traffic situation in the city and past experience accumulated as bus commuters in various hours of the day. A reserve bus has also been allocated to lines with distance above 15 km. Just in case a breakdown takes place in the allocated buses.

In Table–13 below, a summary of the detailed results (can be found in the Appendix). It can be observed that the proposed model generates almost half of the total number of trips reported by Eshot in each period of the day. When the 1-way number of trips proposed by the model are compared with 1-way number of trips of made by Eshot, the high differences can be observed.

	PROPOSED			ESHOT
	1-Way No. of Trips	No. of Bus(Type 1)	No. Of Bus (Type 2)	1-Way No. of Trips
06.00-08.59	1107	496	299	2306
09.00-12.00	854	434	199	1542
12.00-14.59	951	455	210	1823
15.00-17.59	955	449	215	1833
18.00-20.59	718	419	106	1065

Table–13: Comparison of the results found by the proposed model and those of Eshot.

In section 4.1, the number of trips assigned to each route is tabled and the corresponding bus schedule for 5 given periods of time is shown as well as the summary of results. Using these tables, the total operating costs accrued can be calculated by multiplying the number of trips with the distance travelled on these routes. Further, the confidential data provided by Eshot's strategic planning department include the actual average number of trips assigned to each route on a weekday. These are assumed to be made by the cheapest type of bus (single wagon bus-solo) and total actual costs are calculated based on the operating costs of the latter bus type. Thus, the total actual cost that is calculated here represents a lower bound for the true actual costs.

CHAPTER-6: CONCLUSIONS

The aim of this study was to reschedule the bus timetables of the local bus companies in İzmir and evaluate their total operating costs. A mathematical optimization model is used to find out the effectiveness of the schedules that local bus companies were using.

In the first step, the aim of this model is using the bus fleet in a more efficient way. The total number of trips made by Eshot during a randomly chosen weekday is shown in Table-14 below. The day is divided into 5 time periods and periods between 06.00-08.59 and 18.00-20.59 are stated as “rush hours”. The demand of the customers’ hits maximum during selected rush hours.

Periods	Proposed # of Trips	Eshot's # of Trips
06.00-08.59	1107	2346
09.00-11.59	854	1542
12.00-14.59	951	1823
15.00-17.59	955	1833
18.00-20.59	718	1065
TOTAL	**4585**	**8609**

Table-14: Comparison of Total Number of Trips made.

In the model proposed, the total number of trips that have to be made to face the total demand in a randomly selected weekday is 4585. The number of total trips made by Eshot to face the same amount of demand in the same day was 8609. The difference is coming from the inefficient timing schedules that Eshot used. The proposed model developed a new scheduling system, which will be more efficient and more profitable for the company. Table-15 illustrated below was a randomly selected section from the results of the proposed model. The rest of the results were

illustrated in the Appendix section. The route number, total trip number, the number of buses (type 1 or type 2 buses, standard or long) that have to be used, frequency of the departure of the buses from depots and total distance of the routes are shown in columns. For example, the frequency of the buses that will be used in trip number 5 (17.4 km. Length) is 36 minutes. This means that there have to be 5 trips during period 09.00-11.59 (3 hours: 180 minutes).

Analysis of the Period 09.00-11.59					
Trip No.*	1-Way Trip No.	No. of Bus (Type 1)	No. Of Bus (Type 2)	Schedule (per Min.)	Distance (km.)
5 .1	3	2		36,00	17.400
5 .2	2		2		
6 .1	2	2		60,00	22.000
6 .2	1		1		
7 .1	3	2		45,00	16.600
7 .2	1		1		
8 .1	4	3		25,71	33.000
8 .2	3		3		
11 .1	5	3		20,00	15.000
11 .2	4		2		
12 .1	2	1		90,00	13.700

Table-15: Sample from the Results (fully documented in Appendices)

The second step of the thesis is to evaluating the total operating costs of mass transportation companies. Table–14 given below, the costs accrued by the proposed model and the lower bounds of those accrued by Eshot (in YTL) are compared with each other. The savings in operating costs are significant in all time periods and in particular during rush hours. The total operating cost of Eshot during a randomly

chosen weekday is 320.412 YTL; the total opearing cost of the proposed model is 193.456 YTL.

The difference comes from the ineffective timetables that Eshot are using and the unsystematic operating policies. Because of using more vehicles than the optimum vehicle number, the dead costs and the total kilometres made increases, and thus the number of drivers needed incrases. All of this increases in cost factors raises the level of total operating costs.

	time period					
	06.00-08.59	**09.00-11.59**	**12.00-14.59**	**15.00-17.59**	**18.00-20.59**	**TOTAL**
Eshot's Costs	86.205	57.656	68.170	68.564	39.817	**320.412**
Proposed Costs	47.890	35.831	40.274	40.465	28.996	**193.456**

Table –16: Comparison of costs.

If the timetables that proposed model gave are used, the total savings in costs per day amounts up to 65%. These savings exclude the economies that could be gained by reducing the total fleet size (that involves maintenance and personnel costs). The latter economies could justify the renewal of the bus fleet and the inclusion of luxury features such as air condition, mobile entertainment, etc.

The application of the proposed model will synchronize the bus timetables, adjust usage rate of the fleet positively, decrease the deadhead kilometers, and decrease the total operating costs.

Obviously, the implementation of this system would also be beneficial to the passengers who might be having complaints about the irregularities in the bus schedules that lead to unnecessary congestion while traveling and longer waiting times at the bus stops.

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APPENDICES:

Main Data Taken from Eshot – "Inputs":

Route No.	Direction	Zone	Route Details	Length(m.)	# of Vehicles Daily	#of Trips Daily	# of Passengers Daily
5	D	Teleferik	F.ALTAY - İNÖNÜ CD. - VARYANT	17.400	5	47	2128
5	A					47	2175
6	D	Teleferik	NARLIDERE-F.ALTAY -KONAK-TALATPAŞA	22.000	4	28	1234
6	A					27	1263
7	D	Teleferik	NARLIDERE - F.ALTAY - MİTHATPAŞA	16.600	4	42	1612
7	A					39	1765
8	D	Teleferik	MİTHATPAŞA - MONTRÖ - ALSANCAK	33.000	9	60	3098
8	A					55	3136
11	D	Teleferik	F.ALTAY - İNÖNÜ CD.	15.000	2	15	4068
11	A					14	3959
12	D	Teleferik	MİTHATPAŞA - KONAK - TALATPAŞA	13.700	4	6	279
12	A					4	158
15	D	Merkez	NOKTA - ÜÇYOL - VARYANT	4.000	3	42	593
15	A					40	411
18	D	Merkez	DEVLETHAST-ÜZÜMCÜ-VARYANT	8.200	5	25	348
18	A					26	568
19	D	Merkez	DEVLETHAST-B.SİTESİ-ÜÇYOL-VARYANT	7.700	3	43	539
19	A					41	763
20	D	Merkez	DEVLETHAST-ÜÇYOL-VARYANT	9.500	4	43	718
20	A					41	927
21	D	Merkez	ŞATO - KONAK	5.750	7	94	1398
21	A					90	1244
22	D	Merkez	ZİNCİRLİKUYU - EŞREFPAŞA - İKİÇEŞMELİK	3.250	1	4	76
22	A					3	14
23	D	Merkez	ESKİ İZMİR - BOZYAKA - VARYANT	9.000	6	57	1232
23	A					55	1390
26	D	Merkez	ESKİ İZMİR - BOZYAKA - İKİÇEŞMELİK	10.500	6	20	415
26	A					17	284
27	D	Merkez	KARABAĞLAR - VARYANT	8.000	3	52	875
27	A					51	1035
29	D	Merkez	EŞREFPAŞA - VARYANT - İKİÇEŞMELİK	4.550	5	66	529
29	A					65	944
30	D	Merkez	EŞREFPAŞA - VARYANT - İKİÇEŞMELİK	4.750	3	51	573
30	A					50	780
32	D	Merkez	EŞREFPAŞA - İKİÇEŞMELİK	5.005	1	11	92
32	A					11	123
33	D	Merkez	EŞREFPAŞA - VARYANT - İKİÇEŞMELİK	5.750	5	64	884
33	A					61	1121
34	D	Buca	YIKIKKEMER-BASMANE	9.200	6	44	813
34	A					43	805
35	D	Merkez	KAPILAR - BASMANE - GAZİ BULVARI	6.750	5	78	1003
35	A					73	1132
36	D	Buca	YEŞİLDERE-BASMANE	12.000	5	33	745
36	A					32	649
37	D	Buca	ŞİRİNYER-GÜRÇEŞME-BASMANE	8.700	3	2	422
37	A					2	439
38	D	Buca	YIKIKKEMER-KEMER-BASMANE	5.700	4	48	905
38	A					48	893
39	D	Buca	KEMER-BASMANE	5.900	3	32	396
39	A					31	354
42	D	Buca	TOROS-LEVENT-BASMANE	9.750	9	100	2895
42	A					94	2823

Route No.	Direction	Zone	Route Details	Length(m.)	# of Vehicles Daily	#of Trips Daily	# of Passengers Daily
44	G	Buca	KONAK	15.000	1	5	65
44	A					63	1572
46	D	Buca	LEVENT-KEMER-BASMANE	9.150	8	76	2111
46	A					74	2192
48	D	Bornova	OTOGAR - KAMİL TUNCA - ALSANCAK	17.000	5	24	930
48	A					23	997
50	D	Bornova	YEŞİLOVA - MERSİNLİ - ALSANCAK	11.500	3	25	588
50	A					23	610
51	D	Bornova	EGE MH. - ÇINARLI - YEŞİLOVA	11.800	2	16	151
51	A					14	165
53	D	Bornova	1.SANAYİ SİT. - ALSANCAK - MONTRÖ	10.100	4	35	744
53	A					33	503
54	D	Bornova	YEŞİLOVA - MERSİNLİ - YENİŞEHİR	10.600	4	36	1087
54	A					34	1078
58	D	Bornova	KOŞUKAVAK-FATİH CAD.-YENİŞEHİR	9.100	1	3	34
58	A					3	22
59	D	Bornova	KAMİL TUNCA - YENİŞEHİR - BASMANE	10.000	3	20	311
59	A					20	329
60	D	Bornova	5.SAN.SİTESİ - OTOGAR - YENİŞEHİR	16.000	6	52	1577
60	A					49	1811
61	D	Bornova	TALATPAŞA-LİMAN CAD.-ZAFERPAYZIN	7.750	1	5	24
61	A					4	44
62	D	Bornova	BULVAR - ÇINARLI - MONTRÖ	13.650	4	31	924
62	A					29	1122
63	D	Bornova	MANAVKUYU - ADLİYE - MONTRÖ	16.350	16	109	4607
63	A					101	3821
64	D	Bornova	IŞIKKENT - OTOGAR - YENİŞEHİR	11.900	6	50	1359
64	A					47	1281
65	D	Bornova	E.Ü. HASTANESİ - ÇINARLI - MONTRÖ	17.500	2	13	216
65	A					13	193
66	D	Bornova	ADLİYE SARAYI - ÇINARLI - ALSANCAK	10.700	1	3	41
66	A					2	18
67	D	Bornova	DOĞANLAR - IŞIKKENT	15.800	3	23	324
67	A					22	351
70	D	Buca	ŞİRİNYER-İKİÇEŞMELİK-MONTRÖ	15.000	15	111	5216
70	A					108	4176
71	D	Buca	ŞİRİNYER-GÜRÇEŞME-BASMANE	10.850	5	58	1289
71	A					58	1250
72	D	Buca	ŞİRİNYER-VARYANT-İKİÇEŞMELİK	9.900	6	52	1644
72	A					49	1404
73	D	Buca	GÖKSU-AKINCILAR-GÜRÇEŞME	15.500	6	60	1558
73	A					57	1419
74	D	Buca	ENHOŞLAR-ŞİRİNYER-VARYANT-İKİÇEŞMELİK	12.200	3	22	602
74	A					19	405
75	D	Buca	ŞİRİNYER-GÜRÇEŞME-BASMANE	11.550	2	20	460
75	A					19	353
77	D	Karşıyaka	GÜMÜŞPALA - BAYRAKLI - MONTRÖ	15.000	6	56	1262
77	A					55	1493
78	D	Karşıyaka	SOĞUKKUYU - BAYRAKLI - MONTRÖ	18.000	6	52	999
78	A					53	965
79	D	Merkez-Bornova	DEVLETHAST-ÜZÜMCÜ-ÜÇYOL-İKİÇEŞMELİK	13.450	14	99	3814
79	A					97	3888
81	D	Teleferik	İNÖNÜ CD. - İKİÇEŞMELİK	12.000	5	46	1693
81	A					44	1456
82	D	Teleferik	GÜZELBAHÇE - NARLIDERE - İNÖNÜ CD.	32.000	7	49	2213
82	A					48	2261
83	D	Teleferik	MEZARLIK - F.ALTAY - İNÖNÜ CAD.	11.250	1	3	71
83	A					3	62
84	D	Merkez	ÜZÜMCÜ OKULU - SSK - İKİÇEŞMELİK	10.250	2	11	147
84	A					10	89
86	D	Teleferik - Bornova	ATA CD. - İKİÇEŞMELİK - MONTRÖ	17.100	20	150	9193
86	A					147	8730

Route No.	Direction	Zone	Route Details	Length(m.)	# of Vehicles Daily	#of Trips Daily	# of Passengers Daily
87	G	Merkez	BASMANE	19.600	6	62	1240
87	A					58	1419
88	D	Merkez	BOZYAKA - EŞREFPAŞA - İKİÇEŞMELİK	9.500	5	60	1255
88	A					59	1455
89	D	Merkez	ZİNCİRLİKUYU - EŞREFPAŞA - İKİÇEŞMELİK	6.000	2	15	196
89	A					14	156
90	D	Merkez-Bornova	SOSY. KONUT - İKİÇEŞMELİK - ALSANCAK	21.000	17	98	3740
90	A					95	3661
91	D	Merkez	KARABAĞLAR - İKİÇEŞMELİK - KONAK	19.000	5	39	880
91	A					39	751
92	D	Merkez	KARABAĞLAR - VARYANT - İKİÇEŞMELİK	10.800	3	16	178
92	A					14	158
97	D	Bornova	BAYRAKLI - ALSANCAK - MONTRÖ	10.300	1	2	25
97	A					2	11
98	D	Bornova	BAYRAKLI - ALSANCAK - MONTRÖ	9.900	1	1	27
98	A					1	17
99	D	Bornova	BAYRAKLI - ÇINARLI - MONTRÖ	11.800	3	21	468
99	A					19	373
102	D	Bornova	BAYRAKLI - ÇINARLI - MONTRÖ	12.400	2	18	231
102	A					18	205
104	D	Buca	ŞİRİNYER-VARYANT-İKİÇEŞMELİK	11.000	10	65	1847
104	A					62	1655
105	D	Buca	ŞİRİNYER-VARYANT-İKİÇEŞMELİK	12.000	5	36	1550
105	A					33	1205
107	D	Buca	İNÖNÜ.M.-AKINCILAR-İKİÇEŞMELİK	13.750	1	5	124
107	A					4	142
108	D	Merkez	UĞUR MUMCU - YEŞİLKAYA - İKİÇEŞMELİK	8.200	2	12	218
108	A					11	131
109	D	Merkez	BOZYAKA - EŞREFPAŞA - İKİÇEŞMELİK	8.550	4	30	768
109	A					28	454
111	D	Bornova	BORNOVA - E.Ü. HAST.	6.400	2	20	239
111	A					19	201
114	D	Bornova	4.SANAYİ SİT. - E.Ü.HASTANESİ - MONTRÖ	16.650	3	29	2470
114	A					28	2136
116	D	Bornova	MERSİNLİ - E.Ü. HASTANESİ	12.000	2	20	148
116	A					20	202
117	D	Bornova	AMBARLAR - ALTINDAĞ - YENİŞEHİR	16.700	3	22	830
117	A					21	802
119	D	Bornova	YEŞİLOVA - MERSİNLİ - AĞAÇLI YOL	14.500	2	19	200
119	A					19	235
120	D	Karşıyaka	KARŞIYAKA - BAYRAKLI - MONTRÖ	27.000	7	51	1862
120	A					49	1861
121	D	Karşıyaka	KARŞIYAKA - ALTINYOL - TALATPAŞA	23.500	13	96	5338
121	A					91	5252
122	D	Karşıyaka	SERİNKUYU - ALTINYOL - MONTRÖ	17.000	4	36	931
122	A					35	793
123	D	Karşıyaka	SOĞUKKUYU - ALTINYOL - MONTRÖ	22.000	1	1	61
123	A					1	10
124	D	Merkez	BOZYAKA - EŞREFPAŞA	10.850	1	2	35
124	A					1	7
125	D	Karşıyaka	SERİNKUYU - ALTINYOL - MONTRÖ	17.000	4	10	892
125	A					10	772
126	D	Karşıyaka	SERİNKUYU - GİRNE	8.900	1	17	165
126	A					16	140
128	D	Karşıyaka	B.ÇİĞLİ - ALTINYOL - MONTRÖ	26.000	6	46	1798
128	A					43	1586
129	D	Karşıyaka	B.ÇİĞLİ - BAYRAKLI - MONTRÖ	24.000	4	29	801
129	A					28	765
130	D	Karşıyaka-Bornova	KARŞIYAKA - BAYRAKLI - AĞAÇLI YOL	18.000	5	53	1271
130	A					52	1255
131	D	Karşıyaka	BAYRAKLI - ALSANCAK - MONTRÖ	17.500	4	29	496
131	A					26	370
132	D	Karşıyaka	B.ÇİĞLİ - BAYRAKLI - MONTRÖ	27.500	1	9	143
132	A					9	93

Route No.	Direction	Zone	Route Details	Length(m.)	# of Vehicles Daily	#of Trips Daily	# of Passengers Daily
135	D	Karşıyaka	GÜMÜŞPALA - SOĞUKKUYU - GİRNE	11.000	2	25	336
135	A					25	300
136	D	Karşıyaka	DEDEBAŞI - GİRNE	11.950	4	44	490
136	A					40	461
137	D	Karşıyaka	SOĞUKKUYU - GİRNE	7.500	2	28	304
137	A					27	246
138	D	Bornova	BAYRAKLI - ÇAY MAH.	14.800	3	31	592
138	A					30	524
139	D	Bornova	NALDÖKEN - BAYRAKLI	13.900	3	33	523
139	A					31	595
140	D	Karşıyaka	DEDEBAŞI - ALTINYOL - MONTRÖ	19.000	8	66	1595
140	A					64	1440
141	D	Karşıyaka	SERİNKUYU - GİRNE	13.800	2	17	165
141	A					17	172
142	D	Karşıyaka	B.ÇİĞLİ - BAYRAKLI - MONTRÖ	23.500	6	36	1022
142	A					34	446
143	D	Karşıyaka	SERİNKUYU - GİRNE	18.500	5	49	935
143	A					47	1017
144	D	Karşıyaka	SOĞUKKUYU - BAYRAKLI - MONTRÖ	22.500	5	34	664
144	A					31	529
145	D	Karşıyaka	SERİNKUYU - GİRNE	14.000	4	40	712
145	A					38	647
146	D	Karşıyaka	B.ÇİĞLİ - SERİNKUYU - GİRNE	15.150	3	32	757
146	A					30	771
147	D	Karşıyaka	ÖRNEKKÖY - ALTINYOL - MONTRÖ	17.000	4	27	477
147	A					27	297
148	D	Karşıyaka	SOĞUKKUYU - BAYRAKLI - MONTRÖ	20.000	6	49	1184
148	A					46	1052
149	D	Karşıyaka	B.ÇİĞLİ - SERİNKUYU - GİRNE	16.300	3	21	442
149	A					21	491
150	D	Merkez-Bornova	BOZYAKA - KONAK - YENİŞEHİR	16.000	7	63	2776
150	A					62	2797
151	D	Merkez	KARABAĞLAR - ÜÇYOL - VARYANT	12.500	1	13	179
151	A					13	156
152	D	Merkez	SOSY. KONUT - KARABAĞLAR - ÜÇYOL	16.000	8	77	1638
152	A					72	1789
153	D	Buca	MANİFATURACILAR- YENİŞEHİR-BASMANE	7.600	3	30	413
153	A					28	409
156	D	Merkez	KARABAĞLAR - VARYANT	8.450	2	18	257
156	A					17	251
157	D	Merkez	AKTEPE - KARABAĞLAR - İKİÇEŞMELİK	10.500	5	41	831
157	A					40	837
158	D	Merkez	KARABAĞLAR - İKİÇEŞMELİK	9.500	6	51	1087
158	A					47	831
161	D	Merkez	MALİYECİLER SİT-ÜÇYOL-İKİÇEŞMELİK	8.100	4	47	877
161	A					46	830
162	D	Bornova	BAYRAKLI - ÇINARLI - MONTRÖ	12.850	6	73	1477
162	A					68	1746
163	D	Buca	İKİÇEŞMELİK-ALSANCAK-K.TUNCA	21.600	12	69	3244
163	A					68	3027
165	D	Bornova	E.Ü. HAST. - ÇINARLI - MONTRÖ	15.750	7	58	1353
165	A					57	1460
167	D	Teleferik	MEZARLIK - F.ALTAY - MİTHATPAŞA	11.000	1	3	70
167	A					3	38
168	D	Bornova	OSMANGAZİ - ÇINARLI - MONTRÖ	19.250	15	96	3233
168	A					90	2976
169	D	Teleferik - Bornova	ATA CD. - MİTHATPAŞA - TALATPAŞA	17.300	20	151	7781
169	A					145	7116
171	D	Buca	YILDIZ-ŞİRİNYER-EŞREFPAŞA-VARYANT	11.750	5	39	1558
171	A					36	1170
173	D	Merkez-Buca	BEYAZEVLER-AKINCILAR-ŞİRİNYER-ADATEPE	24.000	1	8	147
173	A					7	144
176	D	Buca	HEYKEL-BELENBAŞI-KIRIKLAR-KARACAAĞAÇ	27.800	3	17	276
176	A					16	226

Route No.	Direction	Zone	Route Details	Length(m.)	# of Vehicles Daily	#of Trips Daily	# of Passengers Daily
177	D	Buca	HEYKEL-MEZARLIK-YENİHAL	17.350	1	10	45
177	A					10	52
180	D	Teleferik	İNÖNÜ CAD. - VARYANT	14.000	1	4	31
180	A					4	29
183	D	Teleferik	İNÖNÜ CD. - İKİÇEŞMELİK	10.900	1	1	15
183	A					1	6
190	D	Merkez	YIKIK CAMİ -BOZYAKA - İKİÇEŞMELİK	13.000	10	85	2100
190	A					82	2461
191	D	Merkez	75.YIL İLK ÖĞR.OKULU -BOZYAKA - İKİÇEŞMELİK	20.550	5	35	1546
191	A					34	1654
193	D	Merkez	CENNETÇEŞME - BOZYAKA - VARYANT	12.000	4	50	1051
193	A					47	1353
195	D	Karşıyaka	B.ÇİĞLİ - ALTINYOL - MONTRÖ	22.500	2	14	179
195	A					14	151
197	D	Karşıyaka	GÜMÜŞPALA - GİRNE	10.000	3	34	503
197	A					35	710
198	D	Karşıyaka	SOĞUKKUYU - BAYRAKLI - MONTRÖ	20.500	2	14	300
198	A					12	172
201	D	Merkez-Bornova	ÜZÜMCÜ-ÜÇYOL-İKİÇEŞMELİK	14.500	7	58	1566
201	A					55	1506
205	D	Buca	ŞİRİNYER-GÜRÇEŞME-BASMANE	12.150	6	57	2144
205	A					55	1611
209	D	Teleferik	NARLIDERE - F.ALTAY - MİTHATPAŞA	26.500	4	37	1216
209	A					38	1260
211	D	Teleferik	DÖRTYOL - İNCİRALTI KAVŞ.	7.000	1	0	27
211	A					0	1
214	D	Bornova	4.SAN.SİTESİ - MANAVKUYU - YENİŞEHİR	19.100	4	25	668
214	A					24	558
216	D	Teleferik	MİTHATPAŞA - BASMANE - KAHRAMANLAR	16.200	4	33	688
216	A					33	681
217	D	Teleferik	İNÖNÜ CD. - İKİÇEŞMELİK - KAHRAMANLAR	16.350	4	28	899
217	A					26	871
222	D	Karşıyaka	SERİNKUYU - GİRNE	11.000	2	27	276
222	A					26	298
224	D	Merkez	ŞENTÜRK-Y.CAMİİ-BOZYAKA	10.300	3	42	717
224	A					42	907
225	D	Merkez	ESERKENT - ZİNCİRLİKUYU - İKİÇEŞMELİK	8.800	5	24	765
225	A					20	366
227	D	Karşıyaka	ATAKENT -UĞUR SİTESİ	9.000	4	31	273
227	A					29	329
228	D	Karşıyaka	B.ÇİĞLİ - SERİNKUYU - GİRNE	20.500	4	34	770
228	A					34	780
235	D	Merkez	EŞREFPAŞA - İKİÇEŞMELİK	5.800	2	19	927
235	A					17	473
242	D	Karşıyaka-Bornova	ANADOLU CAD. - BAYRAKLI - MANAVKUYU	25.500	2	11	305
242	A					11	308
243	D	Karşıyaka	ANADOLU CAD. - BAYRAKLI - MANAVKUYU	24.600	2	9	293
243	A					9	234
244	D	Karşıyaka-Bornova	ANADOLU CAD. - BAYRAKLI - MANAVKUYU	23.000	2	11	295
244	A					10	259
245	D	Teleferik-Buca	MİTHATPAŞA - BASMANE - YENİŞEHİR	15.850	9	69	2824
245	A					67	2719
246	D	Karşıyaka	ANADOLU CD. - BAYRAKLI- MONTRÖ	24.500	4	30	748
246	A					29	519
247	D	Karşıyaka	ANADOLU CD. - BAYRAKLI - MONTRÖ	22.500	4	30	440
247	A					29	116
248	D	Bornova	E.Ü.HASTANESİ MERSİNLİ Y.ŞEHİR	18.050	6	42	1050
248	A					39	1077
249	D	Bornova	OSMANGAZİ - MERSİNLİ - YENİŞEHİR	19.500	12	74	2369
249	A					68	2027
250	D	Merkez-Bornova	İKİÇEŞMELİK-ALSANCAK-MERSİNLİ-YEŞİLOVA	22.500	12	75	4080
250	A					73	3974
253	D	Merkez	KARABAĞLAR - VARYANT	23.550	2	7	232
253	A					8	255

Route No.	Direction	Zone	Route Details	Length(m.)	# of Vehicles Daily	#of Trips Daily	# of Passengers Daily
253	D	Merkez	KARABAĞLAR - VARYANT	23.550	2	7	232
253	A					8	255
254	D	Merkez	SOSY. KONUT - KISIKKÖY AYRANCILAR	20.750	1	3	30
254	A					3	29
258	D	Karşıyaka	DEDEBAŞI - GİRNE	9.000	3	39	788
258	A					38	769
267	D	Bornova	EVKA-3 - IŞIKKENT	10.100	3	13	107
267	A					12	104
268	D	Bornova	ANADOLU LİSESİ - MEVLANA	5.100	4	64	1158
268	A					63	1296
269	D	Teleferik	TALATPAŞA - SAHİL YOLU	17.150	6	11	536
269	A					8	1157
270	D	Teleferik - Buca	F.ALTAY - İNÖNÜ CAD. - ŞİRİNYER	25.900	11	66	11
270	A					61	11
271	D	Buca Teleferik	ŞİRİNYER-GÜRÇEŞME-KONAK-MİTHATPAŞA	21.000	3	17	4913
271	A					18	4516
273	D	Buca	FIRAT-ŞİRİNYER-GÜRÇEŞME-BASMANE	11.250	5	50	1089
273	A					49	1323
274	D	Buca	ŞİRİNYER-GÜRÇEŞME-BASMANE	13.700	5	59	1400
274	A					59	1580
275	D	Buca	ŞİRİNYER-GÜRÇEŞME-BASMANE	14.500	5	46	1300
275	A					42	2303
279	D	Merkez-Buca	ORDU CAD - MENDERES AD. - ADATEPE	19.650	1	6	100
279	A					5	122
281	D	Buca-Teleferik	ŞİRİNYER-BOZYAKA.SSK.-İNÖNÜ CD.	22.200	1	3	107
281	A					3	126
285	D	Buca	ŞİRİNYER-VARYANT-İKİÇEŞMELİK	14.000	8	54	1719
285	A					48	1429
287	D	Merkez	HÜRRİYET MAH. - KARABAĞLAR - VARYANT	17.000	7	53	1496
287	A					51	1428
295	D	Karşıyaka	UĞUR MUMCU - ALTINYOL - MONTRÖ	26.000	6	30	1149
295	A					28	1381
299	D	Bornova	BAYRAKLI - ÇINARLI - MONTRÖ	13.200	12	81	2373
299	A					76	2382
300	D	Karşıyaka-Teleferik	ALTINYOL - MÜRSELPAŞA - MİTHATPAŞA	20.000	6	40	1627
300	A					39	1652
305	D	Teleferik	9 EYLÜL HAST. - F.ALTAY - MİTHATPAŞA	13.900	3	34	767
305	A					32	788
311	D	Teleferik	F. ALTAY - MİTHATPAŞA	13.750	3	30	741
311	A					29	767
314	D	Bornova	ADİL DEMİR - 4. SANAYİ - S.KOYUNCU	7.100	3	48	611
314	A					47	791
317	D	Bornova	YEŞİLÇAM - HACILARKIRI - NALDÖKEN	12.200	2	18	278
317	A					17	247
319	D	Teleferik	F. ALTAY - NOKTA - KOOP. EVLERİ	17.500	1	7	194
319	A					7	237
320	D	Teleferik	YELKİ - YALI KAH. -NARLIDERE - İNÖNÜ CAD.	41.000	4	24	1449
320	A					23	1425
322	D	Karşıyaka	TRT BLOKLAR - ŞEMİKLER	11.000	2	27	347
322	A					26	285
324	D	Merkez	İKİÇEŞMELİK-YENİŞEHİR -KEMALPAŞA CAD.	20.000	1	2	5
324	A					2	1
326	D	Karşıyaka	SERİNKUYU - GİRNE	8.000	2	25	389
326	A					26	387
329	D	Karşıyaka	ANADOLU CAD.-ALTINYOL-MONTRÖ	20.950	3	16	136
329	A					14	37
330	D	Karşıyaka-Bornova	BAYRAKLI - MANAVKUYU - BORNOVA	16.000	9	67	2508
330	A					65	2520
342	D	Karşıyaka	B.ÇİĞLİ - ALTINYOL - MONTRÖ	20.500	7	42	1952
342	A					38	1488
343	D	Karşıyaka	SERİNKUYU - GİRNE	14.100	1	7	165
343	A					7	137
344	D	Karşıyaka	SOĞUKKUYU - ALTINYOL - MONTRÖ	20.000	6	39	1245
344	A					36	877

Route No.	Direction	Zone	Route Details	Length(m.)	# of Vehicles Daily	#of Trips Daily	# of Passengers Daily
346	D	Karşıyaka	ANADOLU CD. - ALTINYOL- MONTRÖ	23.000	6	42	1987
346	A					38	1588
349	D	Karşıyaka	ATAKENT UĞUR SİTESİ	18.000	2	10	135
349	A					9	118
352	D	Merkez-Buca	KARABAĞLAR-NATO-ŞİRİNYER	23.800	2	9	237
352	A					9	260
360	D	Karşıyaka-Buca	GİRNE - ALTINYOL - YEŞİLDERE	23.350	1	8	241
360	A					7	946
361	D	Karşıyaka	GİRNE - KARŞIYAKA - ALTINYOL - MONTRÖ	19.000	9	74	2519
361	A					71	2289
370	D	Teleferik	2.İNÖNÜ-F.ALTAY-İNÖNÜ CAD.	15.300	4	35	1747
370	A					34	1753
371	D	Teleferik	2.İNÖNÜ-F.ALTAY-M.PAŞA-BASMANE-MONTRÖ	22.000	4	20	876
371	A					20	327
374	D	Buca	ŞİRİNYER-VARYANT-İKİÇEŞMELİK	12.500	6	52	1540
374	A					48	1349
375	D	Buca-Teleferik	EVKA1-ŞİRİNYER-ÜÇYOL-İNÖNÜ CD.	23.500	2	9	318
375	A					9	233
376	D	Buca	BUCAKOOP-Y. YOL-GÜRÇEŞME-BASMANE	17.350	8	63	2502
376	A					58	2244
377	D	Buca-Bornova	LEVENT-Ç.ÇEŞME.M.PINAR-MERSİNLİ-E.YOL	16.750	1	2	83
377	A					1	9
379	D	Teleferik	F. ALTAY - YEŞİLYURT - DEVLET HAST.	21.200	2	6	227
379	A					7	504
395	D	Karşıyaka	ANADOLU CAD. - BAYRAKLI	20.300	4	19	379
395	A					17	1947
400	D	Karşıyaka	B.ÇİĞLİ - ANADOLU CD. - GİRNE	25.500	7	56	2121
400	A					55	2141
404	D	Teleferik	MİTHATPAŞA	8.500	2	13	212
404	A					13	197
408	D	Merkez	KARABAĞLAR - ÜÇYOL - VARYANT	18.150	7	33	1109
408	A					29	849
427	D	Karşıyaka	DUDAYEV - BOSTANLI	11.500	1	11	187
427	A					10	212
428	D	Karşıyaka	B.ÇİĞLİ - DUDAYEV - ATAKENT	19.500	3	29	787
428	A					27	540
429	D	Karşıyaka	B.ÇİĞLİ - DUDAYEV - ATAKENT	15.000	4	34	603
429	A					30	532
436	D	Karşıyaka	GİRNE	10.000	2	25	259
436	A					24	189
440	D	Karşıyaka		26.000	1	1	59
440	A					1	35
441	D	Buca	ESENTEPE-YIKIKKEMER-UFUK	6.300	1	11	223
441	A					11	228
443	D	Karşıyaka	B.ÇİĞLİ - DUDAYEV - ATAKENT	14.000	7	48	1127
443	A					44	951
445	D	Karşıyaka	DUDAYEV - ATAKENT	12.500	5	53	857
445	A					51	816
446	D	Karşıyaka	B.ÇİĞLİ - DUDAYEV - ATAKENT	15.500	6	58	1279
446	A					53	1075
447	D	Karşıyaka	SERİNKUYU - ŞEMİKLER	13.000	2	18	196
447	A					17	193
450	D	Bornova	OSMAN KİBAR - PARK	5.700	3	45	496
450	A					43	424
451	D	Bornova	75.YIL MAH.-BAYRAKLI	5.850	1	6	16
451	A					6	60
452	D	Bornova	ÇAY MAH..-BAYRAKLI	7.450	1	6	31
452	A					6	33
460	D	Teleferik	TURKUAZ - 9 EYLÜL HAST.HUZUR EVİ	10.200	2	13	151
460	A					13	193
461	D	Karşıyaka	GİRNE BLV.	5.000	3	32	288
461	A					31	228
477	D	Karşıyaka	KÖY YOLU - ALTINYOL - MONTRÖ	15.300	2	19	410
477	A					18	302

Route No.	Direction	Zone	Route Details	Length(m.)	# of Vehicles Daily	#of Trips Daily	# of Passengers Daily
478	D	Buca	HEYKEL-BETONTAŞ-EVKA1	10.800	1	10	91
478	A					9	79
479	D	Teleferik	F. ALTAY - YEŞİLYURT - DEVLET HAST.	19.250	2	7	197
479	A					6	292
480	D	Teleferik	F. ALTAY - ATA CD. - TELEFERİK	9.100	2	27	306
480	A					24	176
486	D	Teleferik	İNÖNÜ CD. - ÜÇYOL	14.250	2	21	671
486	A					19	525
487	D	Karşıyaka	BOSTANLI - YALI CD.	5.050	2	33	800
487	A					31	463
495	D	Karşıyaka	UĞUR MUMCU - DUDAYEV - ATAKENT	19.000	5	29	759
495	A					27	721
498	D	Bornova	B.M.C BLOKLARI - ÇINARLI - ALSANCAK	9.550	2	11	216
498	A					10	122
499	D	Bornova	MANAS - ÇINARLI - MONTRÖ	11.600	1	1	20
499	A					1	1
501	D	Bornova	BAYRAKLI - ÇINARLI	7.150	1	3	17
501	A					2	7
502	D	Bornova	BAYRAKLI - ÇINARLI	7.600	5	29	534
502	A					27	478
503	D	Bornova	ÇAY MAH. MANAS- ÇINARLI	5.950	1	1	29
503	A					1	1
504	D	Bornova	BAYRAKLI - ÇINARLI	6.550	1	3	23
504	A					3	4
505	D	Bornova	BORNOVA ANADOLU LİSESİ - OTOGAR	5.500	3	30	311
505	A					28	273
507	D	Merkez	AKEVLER-BASIN SİTESİ	4.500	1	4	36
507	A					4	34
508	D	Merkez	KARABAĞLAR - ÜÇYOL - VARYANT	21.600	9	61	2155
508	A					57	2331
509	D	Merkez-Teleferik	9.EYL.HST. İŞBANK EVLERİ - SSK - KARABAĞLAR	27.500	6	39	2380
509	A					38	2347
512	D	Teleferik	F.ALTAY - MİTHATPAŞA	13.250	1	1	20
512	A					1	18
514	D	Buca-Karşıyaka	BUCA KOOP-ŞİRİNYER.Y.DERE-KARŞIYAKA	29.500	13	78	4163
514	A					75	4136
515	D	Buca-Bornova	BUCA KOOP-ŞİRİNYER.Y.DERE-ÇINARLI-M.KUYU	28.000	14	78	3888
515	A					76	3598
517	D	Buca - Bornova	GÜRÇEŞME-MERSİNLİ-E.Ü.HAST.	27.500	2	2	85
517	A					2	12
518	D	Buca - Bornova	GÜRÇEŞME-MERSİNLİ-E.Ü.HAST.	27.000	7	27	963
518	A					26	995
519	D	Merkez-Teleferik	ATA CD. - SSK - KARABAĞLAR	23.000	6	34	1459
519	A					35	1551
520	D	Merkez	DEVLETHAST-BASINSİT	7.500	2	35	403
520	A					35	451
523	D	Merkez	ESKİ İZMİR CAD. - ÜZÜMCÜ OK.	7.700	3	50	875
523	A					48	751
524	D	Merkez	YURTOĞLU - CENNETÇEŞME - ÜZÜMCÜ OK.	10.600	4	36	867
524	A					33	843
527	D	Karşıyaka		14.200	2	26	242
527	A					26	313
530	D	Merkez-Bornova	YEŞİLLİK - YEŞİLDERE - YENİŞEHİR	25.000	5	21	443
530	A					21	469
540	D	Karşıyaka	KARŞIYAKA - TURAN - BAYRAKLI	18.650	2	14	383
540	A					13	324
541	D	Buca	YIKIKKEMER-ÇOBANÇEŞME-BOĞAZİÇİ	17.100	1	2	19
541	A					2	31
542	D	Karşıyaka	GİRNE - SERİNKUYU - ANADOLU CAD.	18.400	1	2	11
542	A					2	24
544	D	Buca	Ç.TEPE-Y.KEMER-Y.DERE-BOZYAKA	22.100	1	2	40
544	A					2	36
550	D	Merkez	ESERKENT - ZİNCİRLİKUYU - KİLİMCİ TEPE	5.600	2	34	352
550	A					33	367

Route No.	Direction	Zone	Route Details	Length(m.)	# of Vehicles Daily	#of Trips Daily	# of Passengers Daily
553	D	Merkez-Bornova	KARABAĞLAR - YEŞİLDERE - YENİŞEHİR	21.000	3	15	381
553	A					14	322
554	D	Teleferik	F.ALTAY - MİTHATPAŞA - TALATPAŞA	20.250	8	35	2179
554	A					33	1645
555	D	Bornova	YEŞİLOVA - YILDIRIM BEYAZIT	6.500	3	18	140
555	A					18	129
556	D	Merkez	ESRKENT - ZİNCİRLİKUYU	7.700	2	38	698
556	A					37	633
560	D	Bornova	OTOGAR - KAMİL TUNCA	12.750	4	22	297
560	A					21	309
563	D	Bornova	1.SANAYİ - ADLİYE - MANAVKUYU	9.700	2	21	209
563	A					21	210
564	D	Bornova	OTOGAR - KAMİL TUNCA BULVARI	8.300	4	28	226
564	A					27	206
565	D	Bornova	İNÖNÜ MAH. - BORNOVA	6.700	12	117	3151
565	A					113	3540
568	D	Bornova	OSMANGAZİ - BORNOVA	12.200	10	87	2727
568	A					83	2672
576	D	Buca	BUCA KOOP-ŞİRİNYER-İKİÇEŞMELİK	16.000	7	36	1419
576	A					35	1116
577	D	Karşıyaka	SOĞUKKUYU NALDÖKEN ALTINYOL MONTRÖ	15.000	1	1	11
577	A					0	9
578	D	Karşıyaka	SOĞUKKUYU NALDÖKEN ALTINYOL MONTRÖ	14.000	1	1	46
578	A					0	2
579	D	Merkez	ÜZÜMCÜ-İZSU	6.000	2	39	280
579	A					39	384
583	D	Bornova	STADYUM METRO - MERSİNLİ - 1.SANAYİ	3.700	1	21	54
583	A					20	27
585	D	Bornova	ERSOY CAD. - İNÖNÜ MAH.	7.800	4	46	719
585	A					45	847
586	D	Teleferik	ATA CD. - F. ALTAY - İNÖNÜ CAD.	8.200	6	69	2890
586	A					66	2912
587	D	Merkez	KOOPERATİF EVL. - ÜZÜMCÜ OK.	7.900	2	29	296
587	A					29	307
588	D	Merkez	BARIŞ MAH. - BOZYAKA	7.900	2	33	358
588	A					33	417
590	D	Merkez	SRBSTBÖLGE - KAYMKMLIK-GZİEMİRMEYDAN	9.000	1	2	8
590	A					2	6
591	D	Merkez	GAZİEMİR MEYDAN	4.050	1	1	5
591	A					1	2
595	D	Karşıyaka	B.ÇİĞLİ - DUDAYEV	16.000	1	13	185
595	A					12	144
599	D	Bornova	MANAS - ÇINARLI	9.100	5	31	504
599	A					27	344
600	D	Karşıyaka-Teleferik	ALTINYOL - YEŞİLDERE - İNÖNÜ CD.	23.500	7	62	3160
600	A					62	2964
604	D	Buca	GÜRÇEŞME-YENİŞEHİR-ALTINDAĞ	18.075	4	20	607
604	A					20	604
605	D	Teleferik-Bornova	İNÖNÜ CD. - YEŞİLDERE - OTOGAR	28.500	12	64	3341
605	A					57	2985
612	D	Karşıyaka-Bornova	BAYRAKLI - MERSİNLİ - ALTINDAĞ	17.500	4	31	858
612	A					29	846
614	D	Buca	EVKA 1-İ.EVLERİ-GÜRÇEŞME-OTOGAR	22.700	1	1	42
614	A					1	1
662	D	Merkez-Bornova	YENİŞEHİR -KONAK - ÜÇYOL	24.200	5	24	893
662	A					22	799
663	D	Merkez-Bornova	KONAK - YENİŞEHİR - MANAVKUYU - BORNOVA	25.700	7	27	892
663	A					28	1193
670	D	Teleferik-Buca	İNÖNÜ CD. - BOZYAKA SSK - ŞİRİNYER	25.500	11	67	4427
670	A					61	4230
699	D	Merkez-Bornova	YENİŞEHİR -KONAK - ÜÇYOL	24.500	4	21	1073
699	A					19	858

Results – "Outputs":

Analysis of the Period 06.00-08.59					
Trip No.	1-Way Trip No.	No. of Bus(Type 1)	No. Of Bus (Type 2)	Schedule(per Min.)	Distance (km.)
5 .1	4	3		25,71	17.400
5 .2	3		2		
6 .1	2	2		45,00	22.000
6 .2	2		2		
7 .1	2	2		36,00	16.600
7 .2	3		2		
8 .1	5	4		18,00	33.000
8 .2	5		4		
11 .1	6	4		13,85	15.000
11 .2	7		4		
12 .1	2	1		90,00	13.700
12 .2					
15 .1	1	1		90,00	4.000
15 .2	1		1		
18 .1	2	1		90,00	8.200
18 .2					
19 .1	1	1		90,00	7.700
19 .2	1		1		
20 .1	3	1		60,00	9.500
20 .2					
21 .1	3	1		36,00	5.750
21 .2	2		1		
22 .1	2	1		90,00	3.250
22 .2					
23 .1	2	1		45,00	9.000
23 .2	2		1		
26 .1	2	1		90,00	10.500
26 .2					
27 .1	2	1		60,00	8.000
27 .2	1		1		
29 .1	1	1		90,00	4.550
29 .2	1		1		
30 .1	1	1		90,00	4.750
30 .2	1		1		
32 .1	2	1		90,00	5.005
32 .2					
33 .1	1	1		60,00	5.750
33 .2	2		1		
34 .1	2	1		60,00	9.200
34 .2	1		1		
35 .1	3	1		45,00	6.750
35 .2	1		1		
36 .1	2	1		60,00	12.000
36 .2	1		1		
37 .1	2	1		90,00	8.700
37 .2					
38 .1	1	1		60,00	5.700
38 .2	2		1		
39 .1	2	1		90,00	5.900
39 .2					
42 .1	4	2		20,00	9.750
42 .2	5		2		
44 .1	2	1		36,00	7.500
44 .2	3		2		
46 .1	4	2		25,71	9.150
46 .2	3		1		
48 .1	1	1		60,00	17.000
48 .2	2		2		
50 .1	1	1		90,00	11.500
50 .2	1		1		
51 .1	2	1		90,00	11.800
51 .2					
53 .1	2	1		60,00	10.100
53 .2	1		1		
54 .1	3	1		45,00	10.600
54 .2	1		1		

Analysis of the Period 06.00-08.59					
Trip No.	1-Way Trip No.	No. of Bus(Type 1)	No. Of Bus (Type 2)	Schedule(per Min.)	Distance (km.)
58 .2					
59 .1	2	1		90,00	10.000
59 .2					
60 .1	2	2		36,00	16.000
60 .2	3		2		
61 .1	2	1		90,00	7.750
61 .2					
62 .1	1	1		60,00	13.650
62 .2	2		1		
63 .1	8	4		12,00	16.350
63 .2	7		4		
64 .1	4	2		36,00	11.900
64 .2	1		1		
65 .1	2	2		90,00	17.500
65 .2					
66 .1	2	1		90,00	10.700
66 .2					
67 .1	2	2		90,00	15.800
67 .2					
70 .1	9	6		10,59	15.000
70 .2	8		4		
71 .1	1	1		45,00	10.850
71 .2	3		2		
72 .1	4	2		30,00	9.900
72 .2	2		1		
73 .1	2	2		36,00	15.500
73 .2	3		2		
74 .1	1	1		90,00	12.200
74 .2	1		1		
75 .1	2	1		90,00	11.550
75 .2					
77 .1	2	2		45,00	15.000
77 .2	2		1		
78 .1	3	2		45,00	18.000
78 .2	1		1		
79 .1	5	3		15,00	13.450
79 .2	7		3		
81 .1	4	2		30,00	12.000
81 .2	2		1		
82 .1	3	2		25,71	32.000
82 .2	4		3		
83 .1	2	1		90,00	11.250
83 .2					
84 .1	2	1		90,00	10.250
84 .2					
86 .1	14	11		6,21	17.100
86 .2	15		12		
87 .1	2	1		45,00	9.800
87 .2	2		1		
88 .1	2	1		45,00	9.500
88 .2	2		2		
89 .1	2	1		90,00	6.000
89 .2					
90 .1	6	4		15,00	21.000
90 .2	6		4		
91 .1	2	2		60,00	19.000
91 .2	1		1		
92 .1	2	1		90,00	10.800
92 .2					
97 .1	2	1		90,00	10.300
97 .2					

Analysis of the Period 06.00-08.59					
Trip No.	**1-Way Trip No.**	**No. of Bus(Type 1)**	**No. Of Bus (Type 2)**	**Schedule(per Min.)**	**Distance (km.)**
98 .2					
99 .1	2	1		90,00	11.800
99 .2					
102.1	2	1		90,00	12.400
102.2					
104.1	3	2		30,00	11.000
104.2	3		2		
105.1	2	1		36,00	12.000
105.2	3		2		
107.1	2	1		90,00	13.750
107.2					
108.1	2	1		90,00	8.200
108.2					
109.1	2	1		60,00	8.550
109.2	1		1		
111.1	2	1		90,00	6.400
111.2					
114.1	4	2		22,50	16.650
114.2	4		3		
116.1	2	1		90,00	12.000
116.2					
117.1	2	2		60,00	16.700
117.2	1		1		
119.1	2	2		90,00	14.500
119.2					
120.1	3	2		30,00	27.000
120.2	3		3		
121.1	8	7		10,59	23.500
121.2	9		8		
122.1	1	1		60,00	17.000
122.2	2		2		
123.1	2	2		90,00	22.000
123.2					
124.1	2	1		90,00	10.850
124.2					
125.1	1	1		60,00	17.000
125.2	2		2		
126.1	2	1		90,00	8.900
126.2					
128.1	3	2		30,00	26.000
128.2	3		3		
129.1	2	2		60,00	24.000
129.2	1		1		
130.1	1	1		45,00	18.000
130.2	3		2		
131.1	1	1		90,00	17.500
131.2	1		1		
132.1	2	2		90,00	27.500
132.2					
135.1	2	1		90,00	11.000
135.2					
136.1	2	1		90,00	11.950
136.2					
137.1	2	1		90,00	7.500
137.2					
138.1	1	1		90,00	14.800
138.2	1		1		
139.1	1	1		90,00	13.900
139.2	1		1		
140.1	2	2		36,00	19.000
140.2	3		2		

Analysis of the Period 06.00-08.59					
Trip No.	1-Way Trip No.	No. of Bus(Type 1)	No. Of Bus (Type 2)	Schedule(per Min.)	Distance (km.)
141.2					
142.1	3	2		45,00	23.500
142.2	1		1		
143.1	1	1		60,00	18.500
143.2	2		2		
144.1	3	2		60,00	22.500
144.2					
145.1	3	2		60,00	14.000
145.2					
146.1	2	2		60,00	15.150
146.2	1		1		
147.1	2	2		90,00	17.000
147.2					
148.1	2	2		45,00	20.000
148.2	2		2		
149.1	2	2		90,00	16.300
149.2					
150.1	5	3		20,00	16.000
150.2	4		3		
151.1	2	1		90,00	12.500
151.2					
152.1	4	2		30,00	16.000
152.2	2		2		
153.1	2	1		90,00	7.600
153.2					
156.1	2	1		90,00	8.450
156.2					
157.1	2	1		60,00	10.500
157.2	1		1		
158.1	3	1		45,00	9.500
158.2	1		1		
161.1	2	1		60,00	8.100
161.2	1		1		
162.1	3	1		36,00	12.850
162.2	2		2		
163.1	7	5		16,36	21.600
163.2	4		3		
165.1	4	3		36,00	15.750
165.2	1		1		
167.1	2	2		90,00	11.000
167.2					
168.1	4	3		18,00	19.250
168.2	6		4		
169.1	13	11		7,20	17.300
169.2	12		10		
171.1	2	2		36,00	11.750
171.2	3		2		
173.1	2	2		90,00	24.000
173.2					
176.1	2	2		90,00	27.800
176.2					
177.1	2	2		90,00	17.350
177.2					
180.1	2	2		90,00	14.000
180.2					
183.1	2	2		90,00	10.900
183.2					
190.1	4	2		25,71	13.000
190.2	3		2		
191.1	2	2		36,00	20.550
191.2	3		3		

Analysis of the Period 06.00-08.59					
Trip No.	1-Way Trip No.	No. of Bus(Type 1)	No. Of Bus (Type 2)	Schedule(per Min.)	Distance (km.)
193.2	1		1		
195.1	2	2		90,00	22.500
195.2					
197.1	1	1		90,00	10.000
197.2	1		1		
198.1	2	2		90,00	20.500
198.2					
201.1	2	1		36,00	14.500
201.2	3		2		
205.1	4	2		25,71	12.150
205.2	3		1		
209.1	2	2		45,00	26.500
209.2	2		2		
211.1	2	1		90,00	7.000
211.2					
214.1	3	2		60,00	19.100
214.2					
216.1	3	2		60,00	16.200
216.2					
217.1	1	1		60,00	16.350
217.2	2		2		
222.1	2	1		90,00	11.000
222.2					
224.1	3	2		60,00	10.300
224.2					
225.1	2	1		60,00	8.800
225.2	1		1		
227.1	2	1		90,00	9.000
227.2					
228.1	2	2		60,00	20.500
228.2	1		1		
235.1	1	1		60,00	5.800
235.2	2		1		
242.1	2	2		90,00	25.500
242.2					
243.1	2	2		90,00	24.600
243.2					
244.1	2	2		90,00	23.000
244.2					
245.1	4	3		20,00	15.850
245.2	5		3		
246.1	2	2		60,00	24.500
246.2	1		1		
247.1	2	2		90,00	22.500
247.2					
248.1	3	2		45,00	18.050
248.2	1		1		
249.1	5	3		22,50	19.500
249.2	3		3		
250.1	6	4		13,85	22.500
250.2	7		5		
253.1	2	2		90,00	23.550
253.2					
254.1	2	2		90,00	20.750
254.2					
258.1	2	2		60,00	9.000
258.2	1		1		
267.1	2	2		90,00	10.100
267.2					
268.1	2	1		45,00	5.100
268.2	2		1		

Analysis of the Period 06.00-08.59					
Trip No.	**1-Way Trip No.**	**No. of Bus(Type 1)**	**No. Of Bus (Type 2)**	**Schedule(per Min.)**	**Distance (km.)**
269.1	1	1		90,00	17.150
269.2	1		1		
270.1	2	2		90,00	25.900
270.2					
271.1	9	7		11,25	21.000
271.2	7		5		
273.1	3	1		45,00	11.250
273.2	1		1		
274.1	3	2		36,00	13.700
274.2	2		2		
275.1	4	3		36,00	14.500
275.2	1		1		
279.1	2	2		90,00	19.650
279.2					
281.1	2	2		90,00	22.200
281.2					
285.1	4	2		30,00	14.000
285.2	2		2		
287.1	3	2		36,00	17.000
287.2	2		2		
295.1	2	2		45,00	26.000
295.2	2		2		
299.1	5	3		22,50	13.200
299.2	3		2		
300.1	4	3		30,00	20.000
300.2	2		2		
305.1	2	1		60,00	13.900
305.2	1		1		
311.1	2	1		60,00	13.750
311.2	1		1		
314.1	1	1		90,00	7.100
314.2	1		1		
317.1	2	1		90,00	12.200
317.2					
319.1	2	2		90,00	17.500
319.2					
320.1	3	3		36,00	41.000
320.2	2		2		
322.1	2	1		90,00	11.000
322.2					
324.1	2	2		90,00	20.000
324.2					
326.1	2	1		90,00	8.000
326.2					
329.1	2	2		90,00	20.950
329.2					
330.1	4	3		22,50	16.000
330.2	4		3		
342.1	5	4		25,71	20.500
342.2	2		2		
343.1	2	1		90,00	14.100
343.2					
344.1	2	2		45,00	20.000
344.2	2		2		
346.1	5	4		25,71	23.000
346.2	2		2		
349.1	2	2		90,00	18.000
349.2					
352.1	2	2		90,00	23.800
352.2					
360.1	2	2		90,00	23.350
360.2					

Analysis of the Period 06.00-08.59					
Trip No.	**1-Way Trip No.**	**No. of Bus(Type 1)**	**No. Of Bus (Type 2)**	**Schedule(per Min.)**	**Distance (km.)**
361.1	4	3		22,50	19.000
361.2	4		3		
370.1	4	3		30,00	15.300
370.2	2		2		
371.1	2	2		60,00	22.000
371.2	1		1		
374.1	2	1		36,00	12.500
374.2	3		2		
375.1	2	2		90,00	23.500
375.2					
376.1	4	3		22,50	17.350
376.2	4		3		
377.1	2	2		90,00	16.750
377.2					
379.1	2	2		90,00	21.200
379.2					
395.1	2	2		90,00	20.300
395.2					
400.1	4	3		25,71	25.500
400.2	3		3		
404.1	2	1		90,00	8.500
404.2					
408.1	3	2		45,00	18.150
408.2	1		1		
427.1	2	1		90,00	11.500
427.2					
428.1	2	2		60,00	19.500
428.2	1		1		
429.1	1	1		90,00	15.000
429.2	1		1		
436.1	2	1		90,00	10.000
436.2					
440.1	2	2		90,00	26.000
440.2					
441.1	2	1		90,00	6.300
441.2					
443.1	3	2		45,00	14.000
443.2	1		1		
445.1	2	1		60,00	12.500
445.2	1		1		
446.1	1	1		45,00	15.500
446.2	3		2		
447.1	2	1		90,00	13.000
447.2					
450.1	1	1		90,00	5.700
450.2	1		1		
451.1	2	1		90,00	5.850
451.2					
452.1	2	1		90,00	7.450
452.2					
460.1	2	1		90,00	10.200
460.2					
461.1	2	1		90,00	5.000
461.2					
477.1	2	2		90,00	15.300
477.2					
478.1	2	1		90,00	10.800
478.2					
479.1	2	2		90,00	19.250
479.2					
480.1	2	1		90,00	9.100
480.2					

Analysis of the Period 06.00-08.59					
Trip No.	**1-Way Trip No.**	**No. of Bus(Type 1)**	**No. Of Bus (Type 2)**	**Schedule(per Min.)**	**Distance (km.)**
486.1	3	2		60,00	14.250
486.2					
487.1	2	1		60,00	5.050
487.2	1		1		
495.1	2	2		60,00	19.000
495.2	1		1		
498.1	2	1		90,00	9.550
498.2					
499.1	2	1		90,00	11.600
499.2					
501.1	2	1		90,00	7.150
501.2					
502.1	1	1		90,00	7.600
502.2	1		1		
503.1	2	1		90,00	5.950
503.2					
504.1	2	1		90,00	6.550
504.2					
505.1	2	1		90,00	5.500
505.2					
507.1	2	1		90,00	4.500
507.2					
508.1	3	2		25,71	21.600
508.2	4		3		
509.1	5	3		22,50	27.500
509.2	3		3		
512.1	2	1		90,00	13.250
512.2					
514.1	6	4		13,85	29.500
514.2	7		5		
515.1	5	4		15,00	28.000
515.2	7		5		
517.1	2	2		90,00	27.500
517.2					
518.1	1	1		60,00	27.000
518.2	2		2		
519.1	3	2		36,00	23.000
519.2	2		2		
520.1	2	1		90,00	7.500
520.2					
523.1	2	1		60,00	7.700
523.2	1		1		
524.1	2	1		60,00	10.600
524.2	1		1		
527.1	2	1		90,00	14.200
527.2					
530.1	2	2		90,00	25.000
530.2					
540.1	2	2		90,00	18.650
540.2					
541.1	2	2		90,00	17.100
541.2					
542.1	2	2		90,00	18.400
542.2					
544.1	2	2		90,00	22.100
544.2					
550.1	2	1		90,00	5.600
550.2					
553.1	2	2		90,00	21.000
553.2					
554.1	3	2		25,71	20.250
554.2	4		3		

Analysis of the Period 06.00-08.59

Trip No.	1-Way Trip No.	No. of Bus(Type 1)	No. Of Bus (Type 2)	Schedule(per Min.)	Distance (km.)
555.1	2	1		90,00	6.500
555.2					
556.1	3	1		60,00	7.700
556.2					
560.1	2	1		90,00	12.750
560.2					
563.1	2	1		90,00	9.700
563.2					
564.1	2	1		90,00	8.300
564.2					
565.1	5	2		18,00	6.700
565.2	5		2		
568.1	5	3		20,00	12.200
568.2	4		2		
576.1	3	2		36,00	16.000
576.2	2		2		
577.1	2	2		90,00	15.000
577.2					
578.1	2	1		90,00	14.000
578.2					
579.1	2	1		90,00	6.000
579.2					
583.1	2	1		90,00	3.700
583.2					
585.1	3	1		60,00	7.800
585.2					
586.1	4	2		20,00	8.200
586.2	5		2		
587.1	2	1		90,00	7.900
587.2					
588.1	2	1		90,00	7.900
588.2					
590.1	2	1		90,00	9.000
590.2					
591.1	2	1		90,00	4.050
591.2					
595.1	2	2		90,00	16.000
595.2					
599.1	1	1		90,00	9.100
599.2	1		1		
600.1	5	3		18,00	23.500
600.2	5		4		
604.1	1	1		90,00	18.075
604.2	1		1		
605.1	6	4		16,36	28.500
605.2	5		4		
612.1	2	2		60,00	17.500
612.2	1		1		
614.1	2	2		90,00	22.700
614.2					
662.1	1	1		60,00	24.200
662.2	2		2		
663.1	1	1		60,00	25.700
663.2	2		2		
670.1	7	4		12,86	25.500
670.2	7		5		
699.1	3	2		45,00	24.500
699.2	1		1		
TOTAL	**1098**	**492**	**299**		
Total number of buses used in this period:			**791**		

* In column 1, the numbers on the left of the points symbolize the Bus Route. The numbers(.1 or .2) on the right of the points symbolize the bus types. 1 is for single (solo) bus; 2 is for double bus.

Analysis of the Period 09.00-11.59					
Trip No.*	**1-Way Trip No.**	**No. of Bus(Type 1)**	**No. Of Bus (Type 2)**	**Schedule(per Min.)**	**Distance (km.)**
5 .1	3	2		36,00	17.400
5 .2	2		2		
6 .1	2	2		60,00	22.000
6 .2	1		1		
7 .1	3	2		45,00	16.600
7 .2	1		1		
8 .1	4	3		25,71	33.000
8 .2	3		3		
11 .1	5	3		20,00	15.000
11 .2	4		2		
12 .1	2	1		90,00	13.700
12 .2					
15 .1	2	1		90,00	4.000
15 .2					
18 .1	2	1		90,00	8.200
18 .2					
19 .1	2	1		90,00	7.700
19 .2					
20 .1	2	1		90,00	9.500
20 .2					
21 .1	1	1		60,00	5.750
21 .2	2		1		
22 .1	2	1		90,00	3.250
22 .2					
23 .1	2	1		60,00	9.000
23 .2	1		1		
26 .1	2	1		90,00	10.500
26 .2					
27 .1	1	1		90,00	8.000
27 .2	1		1		
29 .1	2	1		90,00	4.550
29 .2					
30 .1	2	1		90,00	4.750
30 .2					
32 .1	2	1		90,00	5.005
32 .2					
33 .1	1	1		90,00	5.750
33 .2	1		1		
34 .1	1	1		90,00	9.200
34 .2	1		1		
35 .1	3	1		60,00	6.750
35 .2					
36 .1	1	1		90,00	12.000
36 .2	1		1		
37 .1	2	1		90,00	8.700
37 .2					
38 .1	1	1		90,00	5.700
38 .2	1		1		
39 .1	2	1		90,00	5.900
39 .2					
42 .1	2	1		30,00	9.750
42 .2	4		2		
44 .1	3	1		45,00	7.500
44 .2	1		1		
46 .1	3	1		36,00	9.150
46 .2	2		1		
48 .1	1	1		90,00	17.000
48 .2	1		1		
50 .1	2	1		90,00	11.500
50 .2					
51 .1	2	1		90,00	11.800
51 .2					
53 .1	1	1		90,00	10.100
53 .2	1		1		
54 .1	3	2		60,00	10.600
54 .2					

Analysis of the Period 09.00-11.59					
Trip No.*	**1-Way Trip No.**	**No. of Bus(Type 1)**	**No. Of Bus (Type 2)**	**Schedule(per Min.)**	**Distance (km.)**
58 .1	2	1		90,00	9.100
58 .2					
59 .1	2	1		90,00	10.000
59 .2					
60 .1	3	2		45,00	16.000
60 .2	1		1		
61 .1	2	1		90,00	7.750
61 .2					
62 .1	1	1		90,00	13.650
62 .2	1		1		
63 .1	5	3		18,00	16.350
63 .2	5		3		
64 .1	1	1		60,00	11.900
64 .2	2		1		
65 .1	2	2		90,00	17.500
65 .2					
66 .1	2	1		90,00	10.700
66 .2					
67 .1	2	2		90,00	15.800
67 .2					
70 .1	5	3		16,36	15.000
70 .2	6		4		
71 .1	2	1		60,00	10.850
71 .2	1		1		
72 .1	3	2		45,00	9.900
72 .2	1		1		
73 .1	3	2		45,00	15.500
73 .2	1		1		
74 .1	2	1		90,00	12.200
74 .2					
75 .1	2	1		90,00	11.550
75 .2					
77 .1	2	2		60,00	15.000
77 .2	1		1		
78 .1	3	2		60,00	18.000
78 .2					
79 .1	3	2		22,50	13.450
79 .2	5		3		
81 .1	2	2		45,00	12.000
81 .2	2		1		
82 .1	3	2		36,00	32.000
82 .2	2		3		
83 .1	2	1		90,00	11.250
83 .2					
84 .1	2	1		90,00	10.250
84 .2					
86 .1	8	6		9,47	17.100
86 .2	11		9		
87 .1	2	1		60,00	9.800
87 .2	1		1		
88 .1	2	1		60,00	9.500
88 .2	1		1		
89 .1	2	1		90,00	6.000
89 .2					
90 .1	4	3		22,50	21.000
90 .2	4		3		
91 .1	1	1		90,00	19.000
91 .2	1		1		
92 .1	2	1		90,00	10.800
92 .2					
97 .1	2	1		90,00	10.300
97 .2					

Analysis of the Period 09.00-11.59					
Trip No.*	**1-Way Trip No.**	**No. of Bus(Type 1)**	**No. Of Bus (Type 2)**	**Schedule(per Min.)**	**Distance (km.)**
98 .1	2	1		90,00	9.900
98 .2					
99 .1	2	1		90,00	11.800
99 .2					
102.1	2	1		90,00	12.400
102.2					
104.1	2	2		45,00	11.000
104.2	2		1		
105.1	3	2		45,00	12.000
105.2	1		1		
107.1	2	1		90,00	13.750
107.2					
108.1	2	1		90,00	8.200
108.2					
109.1	1	1		90,00	8.550
109.2	1		1		
111.1	2	1		90,00	6.400
111.2					
114.1	4	2		30,00	16.650
114.2	2		2		
116.1	2	1		90,00	12.000
116.2					
117.1	1	1		90,00	16.700
117.2	1		1		
119.1	2	1		90,00	14.500
119.2					
120.1	2	2		45,00	27.000
120.2	2		2		
121.1	7	6		15,00	23.500
121.2	5		4		
122.1	1	1		90,00	17.000
122.2	1		1		
123.1	2	2		90,00	22.000
123.2					
124.1	2	1		90,00	10.850
124.2					
125.1	1	1		90,00	17.000
125.2	1		1		
126.1	2	1		90,00	8.900
126.2					
128.1	2	2		45,00	26.000
128.2	2		2		
129.1	1	1		90,00	24.000
129.2	1		1		
130.1	2	1		60,00	18.000
130.2	1		1		
131.1	2	1		90,00	17.500
131.2					
132.1	2	2		90,00	27.500
132.2					
135.1	2	1		90,00	11.000
135.2					
136.1	2	1		90,00	11.950
136.2					
137.1	2	1		90,00	7.500
137.2					
138.1	2	1		90,00	14.800
138.2					
139.1	2	1		90,00	13.900
139.2					
140.1	3	2		45,00	19.000
140.2	1		1		

Analysis of the Period 09.00-11.59					
Trip No.*	**1-Way Trip No.**	**No. of Bus(Type 1)**	**No. Of Bus (Type 2)**	**Schedule(per Min.)**	**Distance (km.)**
141.1	2	1		90,00	13.800
141.2					
142.1	3	2		60,00	23.500
142.2					
143.1	1	1		90,00	18.500
143.2	1		1		
144.1	2	2		90,00	22.500
144.2					
145.1	2	1		90,00	14.000
145.2					
146.1	1	1		90,00	15.150
146.2	1		1		
147.1	2	2		90,00	17.000
147.2					
148.1	2	2		60,00	20.000
148.2	1		1		
149.1	2	2		90,00	16.300
149.2					
150.1	3	2		30,00	16.000
150.2	3		2		
151.1	2	1		90,00	12.500
151.2					
152.1	3	2		45,00	16.000
152.2	1		1		
153.1	2	1		90,00	7.600
153.2					
156.1	2	1		90,00	8.450
156.2					
157.1	1	1		90,00	10.500
157.2	1		1		
158.1	3	1		60,00	9.500
158.2					
161.1	1	1		90,00	8.100
161.2	1		1		
162.1	3	2		45,00	12.850
162.2	1		1		
163.1	3	2		25,71	21.600
163.2	4		3		
165.1	1	1		60,00	15.750
165.2	2		2		
167.1	2	1		90,00	11.000
167.2					
168.1	3	2		25,71	19.250
168.2	4		3		
169.1	9	7		10,59	17.300
169.2	8		7		
171.1	3	2		45,00	11.750
171.2	1		1		
173.1	2	2		90,00	24.000
173.2					
176.1	2	2		90,00	27.800
176.2					
177.1	2	2		90,00	17.350
177.2					
180.1	2	1		90,00	14.000
180.2					
183.1	2	1		90,00	10.900
183.2					
190.1	3	2		36,00	13.000
190.2	2		2		
191.1	3	2		45,00	20.550
191.2	1		1		

Analysis of the Period 09.00-11.59					
Trip No.*	**1-Way Trip No.**	**No. of Bus(Type 1)**	**No. Of Bus (Type 2)**	**Schedule(per Min.)**	**Distance (km.)**
193.1	3	2		60,00	12.000
193.2					
195.1	2	2		90,00	22.500
195.2					
197.1	2	1		90,00	10.000
197.2					
198.1	2	2		90,00	20.500
198.2					
201.1	3	2		45,00	14.500
201.2	1		1		
205.1	3	2		36,00	12.150
205.2	2		1		
209.1	2	2		60,00	26.500
209.2	1		1		
211.1	2	1		90,00	7.000
211.2					
214.1	2	2		90,00	19.100
214.2					
216.1	2	2		90,00	16.200
216.2					
217.1	1	1		90,00	16.350
217.2	1		1		
222.1	2	1		90,00	11.000
222.2					
224.1	2	1		90,00	10.300
224.2					
225.1	1	1		90,00	8.800
225.2	1		1		
227.1	2	1		90,00	9.000
227.2					
228.1	1	1		90,00	20.500
228.2	1		1		
235.1	1	1		90,00	5.800
235.2	1		1		
242.1	2	2		90,00	25.500
242.2					
243.1	2	2		90,00	24.600
243.2					
244.1	2	2		90,00	23.000
244.2					
245.1	3	2		30,00	15.850
245.2	3		2		
246.1	1	1		90,00	24.500
246.2	1		1		
247.1	2	2		90,00	22.500
247.2					
248.1	3	2		60,00	18.050
248.2					
249.1	2	2		36,00	19.500
249.2	3		2		
250.1	5	3		20,00	22.500
250.2	4		3		
253.1	2	2		90,00	23.550
253.2					
254.1	2	2		90,00	20.750
254.2					
258.1	1	1		90,00	9.000
258.2	1		1		
267.1	2	1		90,00	10.100
267.2					
268.1	2	1		60,00	5.100
268.2	1		1		

Analysis of the Period 09.00-11.59					
Trip No.*	**1-Way Trip No.**	**No. of Bus(Type 1)**	**No. Of Bus (Type 2)**	**Schedule(per Min.)**	**Distance (km.)**
269.1	2	2		90,00	17.150
269.2					
270.1	2	2		90,00	25.900
270.2					
271.1	6	5		16,36	21.000
271.2	5		4		
273.1	3	2		60,00	11.250
273.2					
274.1	1	1		60,00	13.700
274.2	2		1		
275.1	2	1		60,00	14.500
275.2	1		1		
279.1	2	2		90,00	19.650
279.2					
281.1	2	2		90,00	22.200
281.2					
285.1	2	1		45,00	14.000
285.2	2		2		
287.1	3	2		45,00	17.000
287.2	1		1		
295.1	2	2		60,00	26.000
295.2	1		1		
299.1	2	1		36,00	13.200
299.2	3		2		
300.1	3	2		45,00	20.000
300.2	1		1		
305.1	1	1		90,00	13.900
305.2	1		1		
311.1	1	1		90,00	13.750
311.2	1		1		
314.1	2	1		90,00	7.100
314.2					
317.1	2	1		90,00	12.200
317.2					
319.1	2	2		90,00	17.500
319.2					
320.1	1	1		60,00	41.000
320.2	2		2		
322.1	2	1		90,00	11.000
322.2					
324.1	2	2		90,00	20.000
324.2					
326.1	2	1		90,00	8.000
326.2					
329.1	2	2		90,00	20.950
329.2					
330.1	4	3		30,00	16.000
330.2	2		2		
342.1	4	3		36,00	20.500
342.2	1		1		
343.1	2	1		90,00	14.100
343.2					
344.1	2	2		60,00	20.000
344.2	1		1		
346.1	4	3		36,00	23.000
346.2	1		1		
349.1	2	2		90,00	18.000
349.2					
352.1	2	2		90,00	23.800
352.2					
360.1	2	2		90,00	23.350
360.2					

Analysis of the Period 09.00-11.59					
Trip No.*	**1-Way Trip No.**	**No. of Bus(Type 1)**	**No. Of Bus (Type 2)**	**Schedule(per Min.)**	**Distance (km.)**
361.1	4	3		30,00	19.000
361.2	2		2		
370.1	2	2		45,00	15.300
370.2	2		2		
371.1	1	1		90,00	22.000
371.2	1		1		
374.1	3	1		45,00	12.500
374.2	1		1		
375.1	2	2		90,00	23.500
375.2					
376.1	4	3		30,00	17.350
376.2	2		2		
377.1	2	2		90,00	16.750
377.2					
379.1	2	2		90,00	21.200
379.2					
395.1	2	2		90,00	20.300
395.2					
400.1	3	3		36,00	25.500
400.2	2		2		
404.1	2	1		90,00	8.500
404.2					
408.1	2	2		60,00	18.150
408.2	1		1		
427.1	2	1		90,00	11.500
427.2					
428.1	1	1		90,00	19.500
428.2	1		1		
429.1	2	1		90,00	15.000
429.2			1		
436.1	2	1		90,00	10.000
436.2					
440.1	2	2		90,00	26.000
440.2					
441.1	2	1		90,00	6.300
441.2					
443.1	2	2		60,00	14.000
443.2	1		1		
445.1	1	1		90,00	12.500
445.2	1		1		
446.1	2	2		60,00	15.500
446.2	1		1		
447.1	2	1		90,00	13.000
447.2					
450.1	2	1		90,00	5.700
450.2					
451.1	2	1		90,00	5.850
451.2					
452.1	2	1		90,00	7.450
452.2					
460.1	2	1		90,00	10.200
460.2					
461.1	2	1		90,00	5.000
461.2					
477.1	2	2		90,00	15.300
477.2					
478.1	2	1		90,00	10.800
478.2					
479.1	2	2		90,00	19.250
479.2					
480.1	2	1		90,00	9.100
480.2					

Analysis of the Period 09.00-11.59					
Trip No.*	**1-Way Trip No.**	**No. of Bus(Type 1)**	**No. Of Bus (Type 2)**	**Schedule(per Min.)**	**Distance (km.)**
486.1	2	1		90,00	14.250
486.2					
487.1	1	1		90,00	5.050
487.2	1		1		
495.1	1	1		90,00	19.000
495.2	1		1		
498.1	2	1		90,00	9.550
498.2					
499.1	2	1		90,00	11.600
499.2					
501.1	2	1		90,00	7.150
501.2					
502.1	2	1		90,00	7.600
502.2					
503.1	2	1		90,00	5.950
503.2					
504.1	2	1		90,00	6.550
504.2					
505.1	2	1		90,00	5.500
505.2					
507.1	2	1		90,00	4.500
507.2					
508.1	3	2		36,00	21.600
508.2	2		2		
509.1	2	2		36,00	27.500
509.2	3		3		
512.1	2	1		90,00	13.250
512.2					
514.1	5	4		20,00	29.500
514.2	4		4		
515.1	6	5		20,00	28.000
515.2	3		3		
517.1	2	2		90,00	27.500
517.2					
518.1				90,00	27.000
518.2	2		2		
519.1	4	3		45,00	23.000
519.2					
520.1	2	1		90,00	7.500
520.2					
523.1	1	1		90,00	7.700
523.2	1		1		
524.1	1	1		90,00	10.600
524.2	1		1		
527.1	2	1		90,00	14.200
527.2					
530.1	2	2		90,00	25.000
530.2					
540.1	2	2		90,00	18.650
540.2					
541.1	2	2		90,00	17.100
541.2					
542.1	2	2		90,00	18.400
542.2					
544.1	2	2		90,00	22.100
544.2					
550.1	2	1		90,00	5.600
550.2					
553.1	2	2		90,00	21.000
553.2					
554.1	3	2		36,00	20.250
554.2	2		2		

Analysis of the Period 09.00-11.59					
Trip No.*	**1-Way Trip No.**	**No. of Bus(Type 1)**	**No. Of Bus (Type 2)**	**Schedule(per Min.)**	**Distance (km.)**
555.1	2	1		90,00	6.500
555.2					
556.1	2	1		90,00	7.700
556.2					
560.1	2	1		90,00	12.750
560.2					
563.1	2	1		90,00	9.700
563.2					
564.1	2	1		90,00	8.300
564.2					
565.1	4	2		25,71	6.700
565.2	3		1		
568.1	3	2		30,00	12.200
568.2	3		2		
576.1	1	1		60,00	16.000
576.2	2		2		
577.1	2	2		90,00	15.000
577.2					
578.1	2	1		90,00	14.000
578.2					
579.1	2	1		90,00	6.000
579.2					
583.1	2	1		90,00	3.700
583.2					
585.1	2	1		90,00	7.800
585.2					
586.1	2	1		30,00	8.200
586.2	4		2		
587.1	2	1		90,00	7.900
587.2					
588.1	2	1		90,00	7.900
588.2					
590.1	2	1		90,00	9.000
590.2					
591.1	2	1		90,00	4.050
591.2					
595.1	2	2		90,00	16.000
595.2					
599.1	2	1		90,00	9.100
599.2					
600.1	4	3		25,71	23.500
600.2	3		2		
604.1	2	1		90,00	18.075
604.2					
605.1	3	2		25,71	28.500
605.2	4		3		
612.1	1	1		90,00	17.500
612.2	1		1		
614.1	2	2		90,00	22.700
614.2					
662.1	1	1		90,00	24.200
662.2	1		1		
663.1	1	1		90,00	25.700
663.2	1		1		
670.1	6	4		18,00	25.500
670.2	4		4		
699.1	3	2		60,00	24.500
699.2					
TOTAL	**854**	**434**	**199**	* The numbers on the left of the points symbolize the Bus Route. The numbers(.1 or .2) on the right of the points symbolize the bus types. 1 is for single (solo) bus; 2 is for double bus.	
Total number of buses used in this period:			**633**		

Analysis of the Period 12.00-14.59

Trip No.*	1-Way Trip No.	No. of Bus(Type 1)	No. Of Bus (Type 2)	Schedule(per Min.)	Distance (km.)
5 .1	4	3		30,00	17.400
5 .2	2		2		
6 .1	4	2		45,00	22.000
6 .2					
7 .1	1	1		45,00	16.600
7 .2	3		2		
8 .1	4	3		22,50	33.000
8 .2	4		3		
11 .1	4	2		18,00	15.000
11 .2	6		4		
12 .1	2	1		90,00	13.700
12 .2					
15 .1	2	1		90,00	4.000
15 .2					
18 .1	2	1		90,00	8.200
18 .2					
19 .1	2	1		90,00	7.700
19 .2					
20 .1	1	1		90,00	9.500
20 .2	1		1		
21 .1	3	1		45,00	5.750
21 .2	1		1		
22 .1	2	1		90,00	3.250
22 .2					
23 .1	4	2		45,00	9.000
23 .2					
26 .1	2	1		90,00	10.500
26 .2					
27 .1	3	1		60,00	8.000
27 .2					
29 .1	2	1		90,00	4.550
29 .2					
30 .1	2	1		90,00	4.750
30 .2					
32 .1	2	1		90,00	5.005
32 .2					
33 .1	3	1		60,00	5.750
33 .2					
34 .1				90,00	9.200
34 .2	2		1		
35 .1	2	1		60,00	6.750
35 .2	1		1		
36 .1	1	1		90,00	12.000
36 .2	1		1		
37 .1	2	1		90,00	8.700
37 .2					
38 .1	3	1		60,00	5.700
38 .2					
39 .1	2	1		90,00	5.900
39 .2					
42 .1	5	2		22,50	9.750
42 .2	3		2		
44 .1	2	1		45,00	7.500
44 .2	2		1		
46 .1	4	2		30,00	9.150
46 .2	2		1		
48 .1	3	2		60,00	17.000
48 .2					
50 .1	2	1		90,00	11.500
50 .2					
51 .1	2	1		90,00	11.800
51 .2					
53 .1	1	1		90,00	10.100
53 .2	1		1		
54 .1	2	1		60,00	10.600
54 .2	1		1		

Analysis of the Period 12.00-14.59

Trip No.*	1-Way Trip No.	No. of Bus(Type 1)	No. Of Bus (Type 2)	Schedule(per Min.)	Distance (km.)
58 .1	2	1		90,00	9.100
58 .2					
59 .1	2	1		90,00	10.000
59 .2					
60 .1	2	2		45,00	16.000
60 .2	2		2		
61 .1	2	1		90,00	7.750
61 .2					
62 .1	3	2		60,00	13.650
62 .2					
63 .1	7	5		15,00	16.350
63 .2	5		3		
64 .1	3	2		45,00	11.900
64 .2	1		1		
65 .1	2	2		90,00	17.500
65 .2					
66 .1	2	1		90,00	10.700
66 .2					
67 .1	2	2		90,00	15.800
67 .2					
70 .1	6	4		13,85	15.000
70 .2	7		5		
71 .1	3	2		45,00	10.850
71 .2	1		1		
72 .1	4	2		36,00	9.900
72 .2	1		1		
73 .1	2	2		45,00	15.500
73 .2	2		1		
74 .1	2	1		90,00	12.200
74 .2					
75 .1	2	1		90,00	11.550
75 .2					
77 .1	3	2		45,00	15.000
77 .2	1		1		
78 .1	2	2		60,00	18.000
78 .2	1		1		
79 .1	6	3		18,00	13.450
79 .2	4		2		
81 .1	4	2		36,00	12.000
81 .2	1		1		
82 .1	4	3		30,00	32.000
82 .2	2		2		
83 .1	2	1		90,00	11.250
83 .2					
84 .1	2	1		90,00	10.250
84 .2					
86 .1	11	8		7,83	17.100
86 .2	12		9		
87 .1	4	2		45,00	9.800
87 .2					
88 .1	3	1		45,00	9.500
88 .2	1		1		
89 .1	2	1		90,00	6.000
89 .2					
90 .1	6	3		18,00	21.000
90 .2	4		3		
91 .1	3	2		60,00	19.000
91 .2					
92 .1	2	1		90,00	10.800
92 .2					
97 .1	2	1		90,00	10.300
97 .2					

Analysis of the Period 12.00-14.59					
Trip No.*	**1-Way Trip No.**	**No. of Bus(Type 1)**	**No. Of Bus (Type 2)**	**Schedule(per Min.)**	**Distance (km.)**
98 .1	2	1		90,00	9.900
98 .2					
99 .1	2	1		90,00	11.800
99 .2					
102.1	2	1		90,00	12.400
102.2					
104.1	3	2		36,00	11.000
104.2	2		1		
105.1	2	1		45,00	12.000
105.2	2		1		
107.1	2	1		90,00	13.750
107.2					
108.1	2	1		90,00	8.200
108.2					
109.1	1	1		90,00	8.550
109.2	1		1		
111.1	2	1		90,00	6.400
111.2					
114.1	5	2		25,71	16.650
114.2	2		2		
116.1	2	1		90,00	12.000
116.2					
117.1	3	2		60,00	16.700
117.2					
119.1	2	1		90,00	14.500
119.2					
120.1	3	2		36,00	27.000
120.2	2		2		
121.1	8	6		12,86	23.500
121.2	6		5		
122.1	3	2		60,00	17.000
122.2					
123.1	2	2		90,00	22.000
123.2					
124.1	2	1		90,00	10.850
124.2					
125.1	3	2		60,00	17.000
125.2					
126.1	2	1		90,00	8.900
126.2					
128.1	3	2		36,00	26.000
128.2	2		2		
129.1	1	1		90,00	24.000
129.2	1		1		
130.1	3	2		45,00	18.000
130.2	1		1		
131.1	2	2		90,00	17.500
131.2					
132.1	2	2		90,00	27.500
132.2					
135.1	2	1		90,00	11.000
135.2					
136.1	2	1		90,00	11.950
136.2					
137.1	2	1		90,00	7.500
137.2					
138.1	2	1		90,00	14.800
138.2					
139.1	2	1		90,00	13.900
139.2					
140.1	2	2		45,00	19.000
140.2	2		2		

Analysis of the Period 12.00-14.59					
Trip No.*	**1-Way Trip No.**	**No. of Bus(Type 1)**	**No. Of Bus (Type 2)**	**Schedule(per Min.)**	**Distance (km.)**
141.1	2	1		90,00	13.800
141.2					
142.1	2	2		60,00	23.500
142.2	1		1		
143.1	3	2		60,00	18.500
143.2					
144.1	1	1		90,00	22.500
144.2	1		1		
145.1	1	2		90,00	14.000
145.2	1		1		
146.1	1	1		90,00	15.150
146.2	1		1		
147.1	2	2		90,00	17.000
147.2					
148.1	1	1		60,00	20.000
148.2	2		2		
149.1	2	2		90,00	16.300
149.2					
150.1	3	2		25,71	16.000
150.2	4		2		
151.1	2	1		90,00	12.500
151.2					
152.1	1	1		45,00	16.000
152.2	3		2		
153.1	2	1		90,00	7.600
153.2					
156.1	2	1		90,00	8.450
156.2					
157.1	3	2		60,00	10.500
157.2					
158.1	2	1		60,00	9.500
158.2	1		1		
161.1	3	1		60,00	8.100
161.2					
162.1	2	1		45,00	12.850
162.2	2		1		
163.1	3	2		22,50	21.600
163.2	5		3		
165.1	3	2		45,00	15.750
165.2	1		1		
167.1	2	1		90,00	11.000
167.2					
168.1	3	2		22,50	19.250
168.2	5		3		
169.1	8	6		9,47	17.300
169.2	11		8		
171.1	2	1		45,00	11.750
171.2	2		1		
173.1	2	2		90,00	24.000
173.2					
176.1	2	2		90,00	27.800
176.2					
177.1	2	2		90,00	17.350
177.2					
180.1	2	1		90,00	14.000
180.2					
183.1	2	1		90,00	10.900
183.2					
190.1	4	2		30,00	13.000
190.2	2		2		
191.1	2	2		45,00	20.550
191.2	2		2		

Analysis of the Period 12.00-14.59					
Trip No.*	**1-Way Trip No.**	**No. of Bus(Type 1)**	**No. Of Bus (Type 2)**	**Schedule(per Min.)**	**Distance (km.)**
193.1	2	1		60,00	12.000
193.2	1		1		
195.1	2	2		90,00	22.500
195.2					
197.1	2	1		90,00	10.000
197.2					
198.1	2	2		90,00	20.500
198.2					
201.1	2	1		45,00	14.500
201.2	2		2		
205.1	4	2		30,00	12.150
205.2	2		1		
209.1	1	1		60,00	26.500
209.2	2		2		
211.1	2	1		90,00	7.000
211.2					
214.1	1	1		90,00	19.100
214.2	1		1		
216.1	1	1		90,00	16.200
216.2	1		1		
217.1	3	2		60,00	16.350
217.2					
222.1	2	1		90,00	11.000
222.2					
224.1	1	1		90,00	10.300
224.2	1		1		
225.1	1	1		90,00	8.800
225.2	1		1		
227.1	2	1		90,00	9.000
227.2					
228.1	1	1		90,00	20.500
228.2	1		1		
235.1	3	1		60,00	5.800
235.2					
242.1	2	2		90,00	25.500
242.2					
243.1	2	2		90,00	24.600
243.2					
244.1	2	2		90,00	23.000
244.2					
245.1	3	2		25,71	15.850
245.2	4		3		
246.1	1	1		90,00	24.500
246.2	1		1		
247.1	2	2		90,00	22.500
247.2					
248.1	2	2		60,00	18.050
248.2	1		1		
249.1	3	2		30,00	19.500
249.2	3		2		
250.1	4	3		18,00	22.500
250.2	6		4		
253.1	2	2		90,00	23.550
253.2					
254.1	2	2		90,00	20.750
254.2					
258.1	1	1		90,00	9.000
258.2	1		1		
267.1	2	1		90,00	10.100
267.2					
268.1	1	1		60,00	5.100
268.2	2		1		

Analysis of the Period 12.00-14.59

Trip No.*	1-Way Trip No.	No. of Bus(Type 1)	No. Of Bus (Type 2)	Schedule(per Min.)	Distance (km.)
269.1	2	1		90,00	17.150
269.2					
270.1	2	2		90,00	25.900
270.2					
271.1	5	4		15,00	21.000
271.2	7		5		
273.1	2	1		60,00	11.250
273.2	1		1		
274.1	3	2		45,00	13.700
274.2	1		1		
275.1	3	2		45,00	14.500
275.2	1		1		
279.1	2	2		90,00	19.650
279.2					
281.1	2	2		90,00	22.200
281.2					
285.1	4	2		36,00	14.000
285.2	1		1		
287.1	2	2		45,00	17.000
287.2	2		2		
295.1	1	1		60,00	26.000
295.2	2		2		
299.1	3	2		30,00	13.200
299.2	3		2		
300.1	1	1		45,00	20.000
300.2	3		2		
305.1	1	1		90,00	13.900
305.2	1		1		
311.1	1	1		90,00	13.750
311.2	1		1		
314.1	2	1		90,00	7.100
314.2					
317.1	2	1		90,00	12.200
317.2					
319.1	2	2		90,00	17.500
319.2					
320.1	2	2		45,00	41.000
320.2	2		2		
322.1	2	1		90,00	11.000
322.2					
324.1	2	2		90,00	20.000
324.2					
326.1	2	1		90,00	8.000
326.2					
329.1	2	2		90,00	20.950
329.2					
330.1	5	3		25,71	16.000
330.2	2		2		
342.1	2	2		36,00	20.500
342.2	3		2		
343.1	2	1		90,00	14.100
343.2					
344.1	4	2		45,00	20.000
344.2					
346.1	2	2		36,00	23.000
346.2	3		2		
349.1	2	2		90,00	18.000
349.2					
352.1	2	2		90,00	23.800
352.2					
360.1	2	2		90,00	23.350
360.2					

Analysis of the Period 12.00-14.59

Trip No.*	1-Way Trip No.	No. of Bus(Type 1)	No. Of Bus (Type 2)	Schedule(per Min.)	Distance (km.)
361.1	5	3		25,71	19.000
361.2	2		2		
370.1	3	2		36,00	15.300
370.2	2		2		
371.1	3	2		60,00	22.000
371.2					
374.1	2	1		45,00	12.500
374.2	2		1		
375.1	2	2		90,00	23.500
375.2					
376.1	5	3		25,71	17.350
376.2	2		2		
377.1	2	2		90,00	16.750
377.2					
379.1	2	2		90,00	21.200
379.2					
395.1	2	2		90,00	20.300
395.2					
400.1	4	3		30,00	25.500
400.2	2		2		
404.1	2	1		90,00	8.500
404.2					
408.1	2	2		60,00	18.150
408.2	1		1		
427.1	2	1		90,00	11.500
427.2					
428.1	1	1		90,00	19.500
428.2	1		1		
429.1	2	2		90,00	15.000
429.2					
436.1	2	1		90,00	10.000
436.2					
440.1	2	2		90,00	26.000
440.2					
441.1	2	1		90,00	6.300
441.2					
443.1	1	1		60,00	14.000
443.2	2		1		
445.1	3	2		60,00	12.500
445.2					
446.1	3	2		45,00	15.500
446.2	1		1		
447.1	2	1		90,00	13.000
447.2					
450.1	2	1		90,00	5.700
450.2					
451.1	2	1		90,00	5.850
451.2					
452.1	2	1		90,00	7.450
452.2					
460.1	2	1		90,00	10.200
460.2					
461.1	2	1		90,00	5.000
461.2					
477.1	2	2		90,00	15.300
477.2					
478.1	2	1		90,00	10.800
478.2					
479.1	2	2		90,00	19.250
479.2					
480.1	2	1		90,00	9.100
480.2					

Analysis of the Period 12.00-14.59

Trip No.*	1-Way Trip No.	No. of Bus(Type 1)	No. Of Bus (Type 2)	Schedule(per Min.)	Distance (km.)
486.1	1	1		90,00	14.250
486.2	1		1		
487.1	1	1		90,00	5.050
487.2	1		1		
495.1	1	1		90,00	19.000
495.2	1		1		
498.1	2	1		90,00	9.550
498.2					
499.1	2	1		90,00	11.600
499.2					
501.1	2	1		90,00	7.150
501.2					
502.1	2	1		90,00	7.600
502.2					
503.1	2	1		90,00	5.950
503.2					
504.1	2	1		90,00	6.550
504.2					
505.1	2	1		90,00	5.500
505.2					
507.1	2	1		90,00	4.500
507.2					
508.1	4	2		30,00	21.600
508.2	2		2		
509.1	3	3		30,00	27.500
509.2	3		3		
512.1	2	1		90,00	13.250
512.2					
514.1	6	4		16,36	29.500
514.2	5		4		
515.1	5	4		18,00	28.000
515.2	5		4		
517.1	2	2		90,00	27.500
517.2					
518.1	2	2		60,00	27.000
518.2	1		1		
519.1	2	2		45,00	23.000
519.2	2		2		
520.1	2	1		90,00	7.500
520.2					
523.1	3	1		60,00	7.700
523.2					
524.1	3	2		60,00	10.600
524.2					
527.1	2	1		90,00	14.200
527.2					
530.1	2	2		90,00	25.000
530.2					
540.1	2	2		90,00	18.650
540.2					
541.1	2	2		90,00	17.100
541.2					
542.1	2	2		90,00	18.400
542.2					
544.1	2	2		90,00	22.100
544.2					
550.1	2	1		90,00	5.600
550.2					
553.1	2	2		90,00	21.000
553.2					
554.1	4	2		30,00	20.250
554.2	2		2		

Analysis of the Period 12.00-14.59

Trip No.*	1-Way Trip No.	No. of Bus(Type 1)	No. Of Bus (Type 2)	Schedule(per Min.)	Distance (km.)
555.1	2	1		90,00	6.500
555.2					
556.1	1	1		90,00	7.700
556.2	1		1		
560.1	2	1		90,00	12.750
560.2					
563.1	2	1		90,00	9.700
563.2					
564.1	2	1		90,00	8.300
564.2					
565.1	4	2		22,50	6.700
565.2	4		2		
568.1	3	2		25,71	12.200
568.2	4		2		
576.1	3	2		45,00	16.000
576.2	1		1		
577.1	2	2		90,00	15.000
577.2					
578.1	2	1		90,00	14.000
578.2					
579.1	2	1		90,00	6.000
579.2					
583.1	2	1		90,00	3.700
583.2					
585.1	1	1		90,00	7.800
585.2	1		1		
586.1	5	2		22,50	8.200
586.2	3		1		
587.1	2	1		90,00	7.900
587.2					
588.1	2	1		90,00	7.900
588.2					
590.1	2	1		90,00	9.000
590.2					
591.1	2	1		90,00	4.050
591.2					
595.1	2	2		90,00	16.000
595.2					
599.1	2	1		90,00	9.100
599.2					
600.1	4	3		22,50	23.500
600.2	4		3		
604.1	2	2		90,00	18.075
604.2					
605.1	6	4		20,00	28.500
605.2	3		3		
612.1	3	2		60,00	17.500
612.2					
614.1	2	2		90,00	22.700
614.2					
662.1	3	2		60,00	24.200
662.2					
663.1	3	2		60,00	25.700
663.2					
670.1	5	4		16,36	25.500
670.2	6		4		
699.1	2	2		60,00	24.500
699.2	1		1		
TOTAL	**951**	**455**	**210**		

Total number of buses used in this period:	**665**

* The numbers on the left of the points symbolize the Bus Route.
The numbers(.1 or .2) on the right of the points symbolize the bus types. 1 is for single (solo) bus; 2 is for double bus.

Analysis of the Period 15.00-17.59					
Trip No.*	**1-Way Trip No.**	**No. of Bus(Type 1)**	**No. Of Bus (Type 2)**	**Schedule(per Min.)**	**Distance (km.)**
5 .1	4	3		30,00	17.400
5 .2	2		2		
6 .1	4	2		45,00	22.000
6 .2					
7 .1	1	1		45,00	16.600
7 .2	3		2		
8 .1	4	3		22,50	33.000
8 .2	4		3		
11 .1	4	2		18,00	15.000
11 .2	6		4		
12 .1	2	1		90,00	13.700
12 .2					
15 .1	2	1		90,00	4.000
15 .2					
18 .1	2	1		90,00	8.200
18 .2					
19 .1	2	1		90,00	7.700
19 .2					
20 .1	1	1		90,00	9.500
20 .2	1		1		
21 .1	3	1		45,00	5.750
21 .2	1		1		
22 .1	2	1		90,00	3.250
22 .2					
23 .1	4	2		45,00	9.000
23 .2					
26 .1	2	1		90,00	10.500
26 .2					
27 .1	3	1		60,00	8.000
27 .2					
29 .1	2	1		90,00	4.550
29 .2					
30 .1	2	1		90,00	4.750
30 .2					
32 .1	2	1		90,00	5.005
32 .2					
33 .1	3	1		60,00	5.750
33 .2					
34 .1				90,00	9.200
34 .2	2		1		
35 .1	2	1		60,00	6.750
35 .2	1		1		
36 .1	1	1		90,00	12.000
36 .2	1		1		
37 .1	2	1		90,00	8.700
37 .2					
38 .1	3	1		60,00	5.700
38 .2					
39 .1	2	1		90,00	5.900
39 .2					
42 .1	5	2		22,50	9.750
42 .2	3		2		
44 .1	2	1		45,00	7.500
44 .2	2		2		
46 .1	4	2		30,00	9.150
46 .2	2		1		
48 .1	3	2		60,00	17.000
48 .2					
50 .1	2	1		90,00	11.500
50 .2					
51 .1	2	1		90,00	11.800
51 .2					
53 .1	1	1		90,00	10.100
53 .2	1		1		
54 .1	2	1		60,00	10.600
54 .2	1		1		

Analysis of the Period 15.00-17.59					
Trip No.*	**1-Way Trip No.**	**No. of Bus(Type 1)**	**No. Of Bus (Type 2)**	**Schedule(per Min.)**	**Distance (km.)**
58 .1	2	1		90,00	9.100
58 .2					
59 .1	2	1		90,00	10.000
59 .2					
60 .1	2	1		45,00	16.000
60 .2	2		2		
61 .1	2	1		90,00	7.750
61 .2					
62 .1	3	2		60,00	13.650
62 .2					
63 .1	7	4		15,00	16.350
63 .2	5		3		
64 .1	3	2		45,00	11.900
64 .2	1		1		
65 .1	2	2		90,00	17.500
65 .2					
66 .1	2	1		90,00	10.700
66 .2					
67 .1	2	2		90,00	15.800
67 .2					
70 .1	6	3		13,85	15.000
70 .2	7		4		
71 .1	3	2		45,00	10.850
71 .2	1		1		
72 .1	4	2		36,00	9.900
72 .2	1		1		
73 .1	2	2		45,00	15.500
73 .2	2		2		
74 .1	2	1		90,00	12.200
74 .2					
75 .1	2	1		90,00	11.550
75 .2					
77 .1	3	2		45,00	15.000
77 .2	1		1		
78 .1	2	2		60,00	18.000
78 .2	1		1		
79 .1	5	2		18,00	13.450
79 .2	5		3		
81 .1	4	2		36,00	12.000
81 .2	1		1		
82 .1	4	3		30,00	32.000
82 .2	2		2		
83 .1	2	1		90,00	11.250
83 .2					
84 .1	2	1		90,00	10.250
84 .2					
86 .1	11	9		7,83	17.100
86 .2	12		10		
87 .1	3	1		45,00	9.800
87 .2	1		1		
88 .1	3	1		45,00	9.500
88 .2	1		1		
89 .1	2	1		90,00	6.000
89 .2					
90 .1	6	4		18,00	21.000
90 .2	4		3		
91 .1	3	2		60,00	19.000
91 .2					
92 .1	2	1		90,00	10.800
92 .2					
97 .1	2	1		90,00	10.300
97 .2					

Analysis of the Period 15.00-17.59					
Trip No.*	**1-Way Trip No.**	**No. of Bus(Type 1)**	**No. Of Bus (Type 2)**	**Schedule(per Min.)**	**Distance (km.)**
98 .1	2	1		90,00	9.900
98 .2					
99 .1	2	1		90,00	11.800
99 .2					
102.1	2	1		90,00	12.400
102.2					
104.1	3	2		36,00	11.000
104.2	2		2		
105.1	2	1		45,00	12.000
105.2	2		2		
107.1	2	1		90,00	13.750
107.2					
108.1	2	1		90,00	8.200
108.2					
109.1	1	1		90,00	8.550
109.2	1		1		
111.1	2	1		90,00	6.400
111.2					
114.1	5	2		25,71	16.650
114.2	2		2		
116.1	2	1		90,00	12.000
116.2					
117.1	3	2		60,00	16.700
117.2					
119.1	2	1		90,00	14.500
119.2					
120.1	3	2		36,00	27.000
120.2	2		2		
121.1	8	6		12,86	23.500
121.2	6		4		
122.1	2	2		60,00	17.000
122.2	1		1		
123.1	2	2		90,00	22.000
123.2					
124.1	2	1		90,00	10.850
124.2					
125.1	3	2		60,00	17.000
125.2					
126.1	2	1		90,00	8.900
126.2					
128.1	3	2		36,00	26.000
128.2	2		2		
129.1				90,00	24.000
129.2	2		2		
130.1	3	2		45,00	18.000
130.2	1		1		
131.1	2	1		90,00	17.500
131.2					
132.1	2	2		90,00	27.500
132.2					
135.1	2	1		90,00	11.000
135.2					
136.1	2	1		90,00	11.950
136.2					
137.1	2	1		90,00	7.500
137.2					
138.1	2	1		90,00	14.800
138.2					
139.1	2	1		90,00	13.900
139.2					
140.1	2	2		45,00	19.000
140.2	2		2		

Analysis of the Period 15.00-17.59					
Trip No.*	**1-Way Trip No.**	**No. of Bus(Type 1)**	**No. Of Bus (Type 2)**	**Schedule(per Min.)**	**Distance (km.)**
141.1	2	1		90,00	13.800
141.2					
142.1	2	2		60,00	23.500
142.2	1		1		
143.1	2	2		60,00	18.500
143.2	1		1		
144.1	1	1		90,00	22.500
144.2	1		1		
145.1	1	1		90,00	14.000
145.2	1		1		
146.1	1	1		90,00	15.150
146.2	1		1		
147.1	2	2		90,00	17.000
147.2					
148.1	1	1		60,00	20.000
148.2	2		2		
149.1	2	2		90,00	16.300
149.2					
150.1	3	2		25,71	16.000
150.2	4		3		
151.1	2	1		90,00	12.500
151.2					
152.1	4	2		36,00	16.000
152.2	1		1		
153.1	2	1		90,00	7.600
153.2					
156.1	2	1		90,00	8.450
156.2					
157.1	3	2		60,00	10.500
157.2					
158.1	2	1		60,00	9.500
158.2	1		1		
161.1	3	1		60,00	8.100
161.2					
162.1	2	1		45,00	12.850
162.2	2		2		
163.1	3	2		22,50	21.600
163.2	5		3		
165.1	3	2		45,00	15.750
165.2	1		1		
167.1	2	1		90,00	11.000
167.2					
168.1	3	2		22,50	19.250
168.2	5		3		
169.1	11	8		9,00	17.300
169.2	9		7		
171.1	2	1		45,00	11.750
171.2	2		1		
173.1	2	2		90,00	24.000
173.2					
176.1	2	2		90,00	27.800
176.2					
177.1	2	2		90,00	17.350
177.2					
180.1	2	1		90,00	14.000
180.2					
183.1	2	1		90,00	10.900
183.2					
190.1	4	2		30,00	13.000
190.2	2		2		
191.1	2	2		45,00	20.550
191.2	2		2		

Analysis of the Period 15.00-17.59					
Trip No.*	**1-Way Trip No.**	**No. of Bus(Type 1)**	**No. Of Bus (Type 2)**	**Schedule(per Min.)**	**Distance (km.)**
193.1	2	1		60,00	12.000
193.2	1		1		
195.1	2	2		90,00	22.500
195.2					
197.1	2	1		90,00	10.000
197.2					
198.1	2	2		90,00	20.500
198.2					
201.1	2	1		45,00	14.500
201.2	2		2		
205.1	4	2		30,00	12.150
205.2	2		1		
209.1	1	1		60,00	26.500
209.2	2		2		
211.1	2	1		90,00	7.000
211.2					
214.1	1	1		90,00	19.100
214.2	1		1		
216.1	1	1		90,00	16.200
216.2	1		1		
217.1	3	2		60,00	16.350
217.2					
222.1	2	1		90,00	11.000
222.2					
224.1	1	1		90,00	10.300
224.2	1		1		
225.1	1	1		90,00	8.800
225.2	1		1		
227.1	2	1		90,00	9.000
227.2					
228.1	1	1		90,00	20.500
228.2	1		1		
235.1	3	1		60,00	5.800
235.2					
242.1	2	2		90,00	25.500
242.2					
243.1	2	2		90,00	24.600
243.2					
244.1	2	2		90,00	23.000
244.2					
245.1	3	2		25,71	15.850
245.2	4		2		
246.1	1	1		90,00	24.500
246.2	1		1		
247.1	2	2		90,00	22.500
247.2					
248.1	2	2		60,00	18.050
248.2	1		1		
249.1	3	2		30,00	19.500
249.2	3		2		
250.1	7	4		16,36	22.500
250.2	4		3		
253.1	2	2		90,00	23.550
253.2					
254.1	2	2		90,00	20.750
254.2					
258.1	1	1		90,00	9.000
258.2	1		1		
267.1	2	1		90,00	10.100
267.2					
268.1	1	1		60,00	5.100
268.2	2		1		

Analysis of the Period 15.00-17.59					
Trip No.*	**1-Way Trip No.**	**No. of Bus(Type 1)**	**No. Of Bus (Type 2)**	**Schedule(per Min.)**	**Distance (km.)**
269.1	2	2		90,00	17.150
269.2					
270.1	2	2		90,00	25.900
270.2					
271.1	8	6		13,85	21.000
271.2	5		3		
273.1	2	1		60,00	11.250
273.2	1		1		
274.1	3	2		45,00	13.700
274.2	1		1		
275.1	3	2		45,00	14.500
275.2	1		1		
279.1	2	2		90,00	19.650
279.2					
281.1	2	2		90,00	22.200
281.2					
285.1	4	2		36,00	14.000
285.2	1		1		
287.1	2	2		45,00	17.000
287.2	2		2		
295.1	1	1		60,00	26.000
295.2	2		2		
299.1	3	2		30,00	13.200
299.2	3		2		
300.1	1	1		45,00	20.000
300.2	3		2		
305.1	1	1		90,00	13.900
305.2	1		1		
311.1	1	1		90,00	13.750
311.2	1		1		
314.1	2	1		90,00	7.100
314.2					
317.1	2	1		90,00	12.200
317.2					
319.1	2	2		90,00	17.500
319.2					
320.1	2	2		45,00	41.000
320.2	2		2		
322.1	2	1		90,00	11.000
322.2					
324.1	2	2		90,00	20.000
324.2					
326.1	2	1		90,00	8.000
326.2					
329.1	2	2		90,00	20.950
329.2					
330.1	5	3		25,71	16.000
330.2	2		2		
342.1	2	2		36,00	20.500
342.2	3		2		
343.1	2	1		90,00	14.100
343.2					
344.1	3	2		45,00	20.000
344.2	1		1		
346.1	2	2		36,00	23.000
346.2	3		2		
349.1	2	2		90,00	18.000
349.2					
352.1	2	2		90,00	23.800
352.2					
360.1	2	2		90,00	23.350
360.2					

Analysis of the Period 15.00-17.59					
Trip No.*	**1-Way Trip No.**	**No. of Bus(Type 1)**	**No. Of Bus (Type 2)**	**Schedule(per Min.)**	**Distance (km.)**
361.1	5	3		25,71	19.000
361.2	2		2		
370.1	3	2		36,00	15.300
370.2	2		2		
371.1	3	2		60,00	22.000
371.2					
374.1	2	1		45,00	12.500
374.2	2		1		
375.1	2	2		90,00	23.500
375.2					
376.1	5	3		25,71	17.350
376.2	2		2		
377.1	2	2		90,00	16.750
377.2					
379.1	2	2		90,00	21.200
379.2					
395.1	2	2		90,00	20.300
395.2					
400.1	4	3		30,00	25.500
400.2	2		2		
404.1	2	1		90,00	8.500
404.2					
408.1	2	2		60,00	18.150
408.2	1		1		
427.1	2	1		90,00	11.500
427.2					
428.1	1	1		90,00	19.500
428.2	1		1		
429.1	2	1		90,00	15.000
429.2					
436.1	2	1		90,00	10.000
436.2					
440.1	2	2		90,00	26.000
440.2					
441.1	2	1		90,00	6.300
441.2					
443.1	1	1		60,00	14.000
443.2	2		1		
445.1	3	2		60,00	12.500
445.2					
446.1	3	2		45,00	15.500
446.2	1		1		
447.1	2	1		90,00	13.000
447.2					
450.1	2	1		90,00	5.700
450.2					
451.1	2	1		90,00	5.850
451.2					
452.1	2	1		90,00	7.450
452.2					
460.1	2	1		90,00	10.200
460.2					
461.1	2	1		90,00	5.000
461.2					
477.1	2	2		90,00	15.300
477.2					
478.1	2	1		90,00	10.800
478.2					
479.1	2	2		90,00	19.250
479.2					
480.1	2	1		90,00	9.100
480.2					

Analysis of the Period 15.00-17.59					
Trip No.*	**1-Way Trip No.**	**No. of Bus(Type 1)**	**No. Of Bus (Type 2)**	**Schedule(per Min.)**	**Distance (km.)**
486.1	1	1		90,00	14.250
486.2	1		1		
487.1				90,00	5.050
487.2	2		1		
495.1	1	1		90,00	19.000
495.2	1		1		
498.1	2	1		90,00	9.550
498.2					
499.1	2	1		90,00	11.600
499.2					
501.1	2	1		90,00	7.150
501.2					
502.1	2	1		90,00	7.600
502.2					
503.1	2	1		90,00	5.950
503.2					
504.1	2	1		90,00	6.550
504.2					
505.1	2	1		90,00	5.500
505.2					
507.1	2	1		90,00	4.500
507.2					
508.1	4	2		30,00	21.600
508.2	2		2		
509.1	3	2		30,00	27.500
509.2	3		2		
512.1	2	1		90,00	13.250
512.2					
514.1	6	4		16,36	29.500
514.2	5		4		
515.1	5	4		18,00	28.000
515.2	5		4		
517.1	2	2		90,00	27.500
517.2					
518.1	2	2		60,00	27.000
518.2	1		1		
519.1	2	2		45,00	23.000
519.2	2		2		
520.1	2	1		90,00	7.500
520.2					
523.1	3	1		60,00	7.700
523.2					
524.1	3	2		60,00	10.600
524.2					
527.1	2	1		90,00	14.200
527.2					
530.1	2	2		90,00	25.000
530.2					
540.1	2	2		90,00	18.650
540.2					
541.1	2	2		90,00	17.100
541.2					
542.1	2	2		90,00	18.400
542.2					
544.1	2	2		90,00	22.100
544.2					
550.1	2	1		90,00	5.600
550.2					
553.1	2	2		90,00	21.000
553.2					
554.1	4	2		30,00	20.250
554.2	2		2		

Analysis of the Period 15.00-17.59

Trip No.*	1-Way Trip No.	No. of Bus(Type 1)	No. Of Bus (Type 2)	Schedule(per Min.)	Distance (km.)
555.1	2	1		90,00	6.500
555.2					
556.1	1	1		90,00	7.700
556.2	1		1		
560.1	2	1		90,00	12.750
560.2					
563.1	2	1		90,00	9.700
563.2					
564.1	2	1		90,00	8.300
564.2					
565.1	4	1		22,50	6.700
565.2	4		2		
568.1	3	2		25,71	12.200
568.2	4		2		
576.1	2	2		45,00	16.000
576.2	2		2		
577.1	2	2		90,00	15.000
577.2					
578.1	2	1		90,00	14.000
578.2					
579.1	2	1		90,00	6.000
579.2					
583.1	2	1		90,00	3.700
583.2					
585.1	1	1		90,00	7.800
585.2	1		1		
586.1	5	2		22,50	8.200
586.2	3		1		
587.1	2	1		90,00	7.900
587.2					
588.1	2	1		90,00	7.900
588.2					
590.1	2	1		90,00	9.000
590.2					
591.1	2	1		90,00	4.050
591.2					
595.1	2	2		90,00	16.000
595.2					
599.1	2	1		90,00	9.100
599.2					
600.1	4	3		22,50	23.500
600.2	4		3		
604.1	2	1		90,00	18.075
604.2					
605.1	5	3		20,00	28.500
605.2	4		3		
612.1	3	2		60,00	17.500
612.2					
614.1	2	2		90,00	22.700
614.2					
662.1	3	2		60,00	24.200
662.2					
663.1	3	2		60,00	25.700
663.2					
670.1	5	3		16,36	25.500
670.2	6		4		
699.1	2	2		60,00	24.500
699.2	1		1		
TOTAL	**955**	**449**	**215**		

Total number of buses used in this period:	**664**

* The numbers on the left of the points symbolize the Bus Route.
The numbers(.1 or .2) on the right of the points symbolize the bus types. 1 is for single (solo) bus; 2 is for double bus.

Analysis of the Period 18.00-20.59					
Trip No.*	**1-Way Trip No.**	**No. of Bus(Type 1)**	**No. Of Bus (Type 2)**	**Schedule(per Min.)**	**Distance (km.)**
5 .1	4	3		45,00	17.400
5 .2					
6 .1	1	1		90,00	22.000
6 .2	1		1		
7 .1	2	2		60,00	16.600
7 .2	1		1		
8 .1	3	3		36,00	33.000
8 .2	2		2		
11 .1	3	2		30,00	15.000
11 .2	3		2		
12 .1	2	1		90,00	13.700
12 .2					
15 .1	2	1		90,00	4.000
15 .2					
18 .1	2	1		90,00	8.200
18 .2					
19 .1	2	1		90,00	7.700
19 .2					
20 .1	2	1		90,00	9.500
20 .2					
21 .1				90,00	5.750
21 .2	2		1		
22 .1	2	1		90,00	3.250
22 .2					
23 .1	1	1		90,00	9.000
23 .2	1		1		
26 .1	2	1		90,00	10.500
26 .2					
27 .1	2	1		90,00	8.000
27 .2					
29 .1	2	1		90,00	4.550
29 .2					
30 .1	2	1		90,00	4.750
30 .2					
32 .1	2	1		90,00	5.005
32 .2					
33 .1	2	1		90,00	5.750
33 .2					
34 .1	2	1		90,00	9.200
34 .2					
35 .1	2	1		90,00	6.750
35 .2					
36 .1	2	1		90,00	12.000
36 .2					
37 .1	2	1		90,00	8.700
37 .2					
38 .1	2	1		90,00	5.700
38 .2					
39 .1	2	1		90,00	5.900
39 .2					
42 .1	4	2		36,00	9.750
42 .2	1		1		
44 .1	3	1		60,00	7.500
44 .2					
46 .1	4	2		45,00	9.150
46 .2					
48 .1	2	2		90,00	17.000
48 .2					
50 .1	2	1		90,00	11.500
50 .2					
51 .1	2	1		90,00	11.800
51 .2					
53 .1	2	1		90,00	10.100
53 .2					
54 .1	1	1		90,00	10.600
54 .2	1		1		

Analysis of the Period 18.00-20.59					
Trip No.*	**1-Way Trip No.**	**No. of Bus(Type 1)**	**No. Of Bus (Type 2)**	**Schedule(per Min.)**	**Distance (km.)**
58 .1	2	1		90,00	9.100
58 .2					
59 .1	2	1		90,00	10.000
59 .2					
60 .1	3	2		60,00	16.000
60 .2					
61 .1	2	1		90,00	7.750
61 .2					
62 .1	2	1		90,00	13.650
62 .2					
63 .1	4	2		25,71	16.350
63 .2	3		2		
64 .1	1	1		90,00	11.900
64 .2	1		1		
65 .1	2	2		90,00	17.500
65 .2					
66 .1	2	1		90,00	10.700
66 .2					
67 .1	2	2		90,00	15.800
67 .2					
70 .1	4	2		22,50	15.000
70 .2	4		2		
71 .1	1	1		90,00	10.850
71 .2	1		1		
72 .1	2	1		60,00	9.900
72 .2	1		1		
73 .1	3	2		60,00	15.500
73 .2					
74 .1	2	1		90,00	12.200
74 .2					
75 .1	2	1		90,00	11.550
75 .2					
77 .1	1	1		90,00	15.000
77 .2	1		1		
78 .1	2	2		90,00	18.000
78 .2					
79 .1	4	2		30,00	13.450
79 .2	2		1		
81 .1	2	1		60,00	12.000
81 .2	1		1		
82 .1	3	2		45,00	32.000
82 .2	1		1		
83 .1	2	1		90,00	11.250
83 .2					
84 .1	2	1		90,00	10.250
84 .2					
86 .1	8	6		12,86	17.100
86 .2	6		4		
87 .1	1	1		90,00	9.800
87 .2	1		1		
88 .1	1	1		90,00	9.500
88 .2	1		1		
89 .1	2	1		90,00	6.000
89 .2					
90 .1	4	3		30,00	21.000
90 .2	2		2		
91 .1	2	2		90,00	19.000
91 .2					
92 .1	2	1		90,00	10.800
92 .2					
97 .1	2	1		90,00	10.300
97 .2					

Analysis of the Period 18.00-20.59					
Trip No.*	**1-Way Trip No.**	**No. of Bus(Type 1)**	**No. Of Bus (Type 2)**	**Schedule(per Min.)**	**Distance (km.)**
98 .1	2	1		90,00	9.900
98 .2					
99 .1	2	1		90,00	11.800
99 .2					
102.1	2	1		90,00	12.400
102.2					
104.1	2	1		60,00	11.000
104.2	1		1		
105.1	3	2		60,00	12.000
105.2					
107.1	2	1		90,00	13.750
107.2					
108.1	2	1		90,00	8.200
108.2					
109.1	2	1		90,00	8.550
109.2					
111.1	2	1		90,00	6.400
111.2					
114.1	2	2		45,00	16.650
114.2	2		2		
116.1	2	1		90,00	12.000
116.2					
117.1	2	2		90,00	16.700
117.2					
119.1	2	1		90,00	14.500
119.2					
120.1	2	2		60,00	27.000
120.2	1		1		
121.1	4	3		22,50	23.500
121.2	4		3		
122.1	2	2		90,00	17.000
122.2					
123.1	2	2		90,00	22.000
123.2					
124.1	2	1		90,00	10.850
124.2					
125.1	2	2		90,00	17.000
125.2					
126.1	2	1		90,00	8.900
126.2					
128.1	2	2		60,00	26.000
128.2	1		1		
129.1	2	2		90,00	24.000
129.2					
130.1	1	1		90,00	18.000
130.2	1		1		
131.1	2	2		90,00	17.500
131.2					
132.1	2	2		90,00	27.500
132.2					
135.1	2	1		90,00	11.000
135.2					
136.1	2	1		90,00	11.950
136.2					
137.1	2	1		90,00	7.500
137.2					
138.1	2	1		90,00	14.800
138.2					
139.1	2	1		90,00	13.900
139.2					

Analysis of the Period 18.00-20.59

Trip No.*	1-Way Trip No.	No. of Bus(Type 1)	No. Of Bus (Type 2)	Schedule(per Min.)	Distance (km.)
140.1	3	2		60,00	19.000
140.2					
141.1	2	1		90,00	13.800
141.2					
142.1	2	2		90,00	23.500
142.2					
143.1	2	2		90,00	18.500
143.2					
144.1	2	2		90,00	22.500
144.2					
145.1	2	1		90,00	14.000
145.2					
146.1	2	1		90,00	15.150
146.2					
147.1	2	2		90,00	17.000
147.2					
148.1	1	1		90,00	20.000
148.2	1		1		
149.1	2	2		90,00	16.300
149.2					
150.1	1	1		45,00	16.000
150.2	3		2		
151.1	2	1		90,00	12.500
151.2					
152.1	2	2		60,00	16.000
152.2	1		1		
153.1	2	1		90,00	7.600
153.2					
156.1	2	1		90,00	8.450
156.2					
157.1	2	1		90,00	10.500
157.2					
158.1	1	1		90,00	9.500
158.2	1		1		
161.1	2	1		90,00	8.100
161.2					
162.1	3	2		60,00	12.850
162.2					
163.1	3	2		36,00	21.600
163.2	2		2		
165.1	1	1		90,00	15.750
165.2	1		1		
167.1	2	1		90,00	11.000
167.2					
168.1	3	2		36,00	19.250
168.2	2		2		
169.1	7	5		15,00	17.300
169.2	5		4		
171.1	3	2		60,00	11.750
171.2					
173.1	2	2		90,00	24.000
173.2					
176.1	2	2		90,00	27.800
176.2					
177.1	2	2		90,00	17.350
177.2					
180.1	2	1		90,00	14.000
180.2					
183.1	2	1		90,00	10.900
183.2					
190.1	1	1		60,00	13.000
190.2	2		1		

Analysis of the Period 18.00-20.59					
Trip No.*	**1-Way Trip No.**	**No. of Bus(Type 1)**	**No. Of Bus (Type 2)**	**Schedule(per Min.)**	**Distance (km.)**
191.1	3	2		60,00	20.550
191.2					
193.1	2	1		90,00	12.000
193.2					
195.1	2	2		90,00	22.500
195.2					
197.1	2	1		90,00	10.000
197.2					
198.1	2	2		90,00	20.500
198.2					
201.1	3	2		60,00	14.500
201.2					
205.1	3	2		45,00	12.150
205.2	1		1		
209.1	1	1		90,00	26.500
209.2	1		1		
211.1	2	1		90,00	7.000
211.2					
214.1	2	2		90,00	19.100
214.2					
216.1	2	2		90,00	16.200
216.2					
217.1	2	2		90,00	16.350
217.2					
222.1	2	1		90,00	11.000
222.2					
224.1	2	1		90,00	10.300
224.2					
225.1	2	1		90,00	8.800
225.2					
227.1	2	1		90,00	9.000
227.2					
228.1	2	2		90,00	20.500
228.2					
235.1	2	1		90,00	5.800
235.2					
242.1	2	2		90,00	25.500
242.2					
243.1	2	2		90,00	24.600
243.2					
244.1	2	2		90,00	23.000
244.2					
245.1	4	3		36,00	15.850
245.2	1		1		
246.1	2	2		90,00	24.500
246.2					
247.1	2	2		90,00	22.500
247.2					
248.1	2	2		90,00	18.050
248.2					
249.1	3	2		45,00	19.500
249.2	1		1		
250.1	3	2		30,00	22.500
250.2	3		2		
253.1	2	2		90,00	23.550
253.2					
254.1	2	2		90,00	20.750
254.2					
258.1	2	1		90,00	9.000
258.2					
267.1	2	1		90,00	10.100
267.2					

Analysis of the Period 18.00-20.59

Trip No.*	1-Way Trip No.	No. of Bus(Type 1)	No. Of Bus (Type 2)	Schedule(per Min.)	Distance (km.)
268.1	1	1		90,00	5.100
268.2	1		1		
269.1	2	2		90,00	17.150
269.2					
270.1	2	2		90,00	25.900
270.2					
271.1	5	4		22,50	21.000
271.2	3		3		
273.1	1	1		90,00	11.250
273.2	1		1		
274.1				90,00	13.700
274.2	2		1		
275.1	1	1		90,00	14.500
275.2	1		1		
279.1	2	2		90,00	19.650
279.2					
281.1	2	2		90,00	22.200
281.2					
285.1	2	1		60,00	14.000
285.2	1		1		
287.1	3	2		60,00	17.000
287.2					
295.1	1	1		90,00	26.000
295.2	1		1		
299.1	3	2		45,00	13.200
299.2	1		1		
300.1	2	2		60,00	20.000
300.2	1		1		
305.1	2	1		90,00	13.900
305.2					
311.1	2	1		90,00	13.750
311.2					
314.1	2	1		90,00	7.100
314.2					
317.1	2	1		90,00	12.200
317.2					
319.1	2	2		90,00	17.500
319.2					
320.1	3	3		60,00	41.000
320.2					
322.1	2	1		90,00	11.000
322.2					
324.1	2	2		90,00	20.000
324.2					
326.1	2	1		90,00	8.000
326.2					
329.1	2	2		90,00	20.950
329.2					
330.1	2	2		45,00	16.000
330.2	2		2		
342.1	1	1		60,00	20.500
342.2	2		2		
343.1	2	1		90,00	14.100
343.2					
344.1	1	1		90,00	20.000
344.2	1		1		
346.1	1	1		60,00	23.000
346.2	2		2		
349.1	2	2		90,00	18.000
349.2					
352.1	2	2		90,00	23.800
352.2					
360.1	2	2		90,00	23.350
360.2					

Analysis of the Period 18.00-20.59

Trip No.*	1-Way Trip No.	No. of Bus(Type 1)	No. Of Bus (Type 2)	Schedule(per Min.)	Distance (km.)
361.1	2	2		45,00	19.000
361.2	2		2		
370.1	2	2		60,00	15.300
370.2	1		1		
371.1	2	2		90,00	22.000
371.2					
374.1	3	2		60,00	12.500
374.2					
375.1	2	2		90,00	23.500
375.2					
376.1	2	2		45,00	17.350
376.2	2		2		
377.1	2	2		90,00	16.750
377.2					
379.1	2	2		90,00	21.200
379.2					
395.1	2	2		90,00	20.300
395.2					
400.1	4	3		45,00	25.500
400.2					
404.1	2	1		90,00	8.500
404.2					
408.1	1	1		90,00	18.150
408.2	1		1		
427.1	2	1		90,00	11.500
427.2					
428.1	2	2		90,00	19.500
428.2					
429.1	2	1		90,00	15.000
429.2					
436.1	2	1		90,00	10.000
436.2					
440.1	2	2		90,00	26.000
440.2					
441.1	2	1		90,00	6.300
441.2					
443.1	1	1		90,00	14.000
443.2	1		1		
445.1	2	1		90,00	12.500
445.2					
446.1	1	1		90,00	15.500
446.2	1		1		
447.1	2	1		90,00	13.000
447.2					
450.1	2	1		90,00	5.700
450.2					
451.1	2	1		90,00	5.850
451.2					
452.1	2	1		90,00	7.450
452.2					
460.1	2	1		90,00	10.200
460.2					
461.1	2	1		90,00	5.000
461.2					
477.1	2	2		90,00	15.300
477.2					
478.1	2	1		90,00	10.800
478.2					
479.1	2	2		90,00	19.250
479.2					
480.1	2	1		90,00	9.100
480.2					

Analysis of the Period 18.00-20.59

Trip No.*	1-Way Trip No.	No. of Bus(Type 1)	No. Of Bus (Type 2)	Schedule(per Min.)	Distance (km.)
486.1	2	1		90,00	14.250
486.2					
487.1	2	1		90,00	5.050
487.2					
495.1	2	2		90,00	19.000
495.2					
498.1	2	1		90,00	9.550
498.2					
499.1	2	1		90,00	11.600
499.2					
501.1	2	1		90,00	7.150
501.2					
502.1	2	1		90,00	7.600
502.2					
503.1	2	1		90,00	5.950
503.2					
504.1	2	1		90,00	6.550
504.2					
505.1	2	1		90,00	5.500
505.2					
507.1	2	1		90,00	4.500
507.2					
508.1	3	2		45,00	21.600
508.2	1		1		
509.1	3	3		45,00	27.500
509.2	1		1		
512.1	2	1		90,00	13.250
512.2					
514.1	2	2		30,00	29.500
514.2	4		3		
515.1	3	2		30,00	28.000
515.2	3		3		
517.1	2	2		90,00	27.500
517.2					
518.1	2	2		90,00	27.000
518.2					
519.1	3	2		60,00	23.000
519.2					
520.1	2	1		90,00	7.500
520.2					
523.1	2	1		90,00	7.700
523.2					
524.1	2	1		90,00	10.600
524.2					
527.1	2	1		90,00	14.200
527.2					
530.1	2	2		90,00	25.000
530.2					
540.1	2	2		90,00	18.650
540.2					
541.1	2	2		90,00	17.100
541.2					
542.1	2	2		90,00	18.400
542.2					
544.1	2	2		90,00	22.100
544.2					
550.1	2	1		90,00	5.600
550.2					
553.1	2	2		90,00	21.000
553.2					
554.1	3	2		45,00	20.250
554.2	1		1		

Analysis of the Period 18.00-20.59

Trip No.*	1-Way Trip No.	No. of Bus(Type 1)	No. Of Bus (Type 2)	Schedule(per Min.)	Distance (km.)
555.1	2	1		90,00	6.500
555.2					
556.1	2	1		90,00	7.700
556.2					
560.1	2	1		90,00	12.750
560.2					
563.1	2	1		90,00	9.700
563.2					
564.1	2	1		90,00	8.300
564.2					
565.1	3	1		36,00	6.700
565.2	2		1		
568.1	2	1		45,00	12.200
568.2	2		1		
576.1	3	2		60,00	16.000
576.2					
577.1	2	2		90,00	15.000
577.2					
578.1	2	1		90,00	14.000
578.2					
579.1	2	1		90,00	6.000
579.2					
583.1	2	1		90,00	3.700
583.2					
585.1	2	1		90,00	7.800
585.2					
586.1	4	2		36,00	8.200
586.2	1		1		
587.1	2	1		90,00	7.900
587.2					
588.1	2	1		90,00	7.900
588.2					
590.1	2	1		90,00	9.000
590.2					
591.1	2	1		90,00	4.050
591.2					
595.1	2	2		90,00	16.000
595.2					
599.1	2	1		90,00	9.100
599.2					
600.1	3	3		36,00	23.500
600.2	2		2		
604.1	2	2		90,00	18.075
604.2					
605.1	2	2		36,00	28.500
605.2	3		3		
612.1	2	2		90,00	17.500
612.2					
614.1	2	2		90,00	22.700
614.2					
662.1	2	2		90,00	24.200
662.2					
663.1	2	2		90,00	25.700
663.2					
670.1	4	3		25,71	25.500
670.2	3		3		
699.1	1	1		90,00	24.500
699.2	1		1		
TOTAL	**718**	**419**	**106**		

Total number of buses used in this period:	**525**

* The numbers on the left of the points symbolize the Bus Route.
The numbers(.1 or .2) on the right of the points symbolize the bus types. 1 is for single (solo) bus; 2 is for double bus.