



University of Alexandria

Faculty of Engineering

Division of Communications & Electronics

Subject Name: Microprocessors-1

Lecturers: Prof. Mohamed El-Banna

Programs Using Microprocessors

Instructions to Students

- One student only works in each project.
- The projects are distributed as follows: project# i is assigned to the students whose number ends by i. For example, project 1 is assigned to students whose numbers ends by 1 such as 1, 11, 21, 31,..., 101, 201 and so on.
- Use the user-interface of the emulator to read the inputs and show the outputs.
- At the submission, everyone is expected to show full understanding of his code. Quick discussion in the code will be hold to ensure no copied projects. (copied projects----→ Zero)
- You are not allowed to submit from emulator examples direct without a change.

Project#0: Classroom grading:

A classroom has 25 students. It is required to rearrange them in descending order according to their grades in the microprocessor course.

The inputs are two tables. The first table contains the student number and the second one contains their grades.

The outputs are two tables. The first one contains the student number arranged according to their grades and the second table shows these grades.

Project #1: Car waiting meter

In the car parking, a car waiting meter is used. The driver puts a certain amount of money and this meter will allow him to park his car for a specific time.

The price list is as follows:

1 pound → 5 sec, 5 pound → 30 sec, 10 pound → 60 sec.

If the time is expired, a red led will turn on.

The input is the amount of money.

The output is LED turned red if time is expired.

Project #2: Packet transmission control

Consider the maximum capacity of a network is 128 packets. The user starts his packets transmission by 1 packet. Then he/she increases the number of packets according to the following rules:

If the number of transmitted packets < 64 packets, the number will be doubled.

If the number of transmitted packets \geq 64 packets, the number will be increased by 1.

If the number of transmitted packets = 128 packets, the user will start over and transmit 1 packets and repeat the previous rules.

The input is the size of the transmitted file.

The output is the number of Transmissions used to transmit this file.

Project#3: Security Lock

In the bank, a security lock is used to access some rooms. This lock accepts two inputs: the employee identification number (16 bits) and his/her password (4 bits). If the bank has 20 employees, construct their database and store it in the memory. Then write a program to access these rooms.

The inputs of the program are the employee identification and the password.

The output is one bit (0/1) that means (denied/allowed).

Project#4: Monoalphabetic Substitution Encryption:

In the monoalphabetic substitution encryption, each alphabetic letter is substituted by another letter according to the following table:

Plain text	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z
Cipher text	q	w	e	r	t	y	u	i	o	p	a	s	d	f	g	h	j	k	l	z	x	c	v	b	n	m

Construct this table and store it in the memory.

Write a program that allowed you to enter a plain text message, encrypt this message using the stored table, then decrypt the cipher text to obtain the original text message.

Omit any space between words in your message.

Project#5: Marathon results:

25 players are participated in a marathon. Their numbers and time in which they completed the marathon are stored in the memory. It is required to rearrange them in ascending order to find the winner.

The inputs are two tables. The first table contains the player number and the second one contains their recorded time.

The outputs are two tables. The first one contains the player number arranged according to their times and the second table shows these times.

Project#6: Traffic light control

Write a program to control the time of the traffic lights. The red and green signals should be on for 3 minutes. The yellow signal should be on for 1 minute.

Project#7: Heater Alarm

Consider a boiler in a petrochemical factory. Its temperature is measured every 3 minutes.

If the temperature $\leq 200^{\circ}\text{C}$, a green led will turn on.

If the $200 < \text{temperature} < 500^{\circ}\text{C}$, a yellow led will turn on.

If the temperature $\geq 500^{\circ}\text{C}$, a red led will turn on.

Write a program that reads the temperature every 3 minutes and shows the LED condition.

Project#8: ATM Machine

In ATM machine, an electronic lock circuit is used to authorize the card. This circuit has two input codes: The card number that consists of 16 bits and the password that consists of 4 bits. If the bank has 20 customers only uses the cards. Construct their database and store it in the memory. Then write a program for card authorization.

The inputs of the program are the card number and the password.

The output is one bit (0/1) that means (denied/allowed).

Project#9: Mononumeric substitution encryption:

In the monoalphabetic substitution encryption, each alphabetic letter is substituted by another letter according to the following table:

Plain text	a	b	c	d	e	f	g	h	i	j	k	l	m
Cipher text	1	2	3	4	5	6	7	8	9	10	11	12	13

Plain text	n	O	p	q	r	s	t	u	v	w	x	y	z
Cipher text	14	15	16	17	18	19	20	21	22	23	24	25	26

Construct this table and store it in the memory.

Write a program that allowed you to enter a text message, encrypt this message using the stored table, then decrypt the cipher text to obtain the original text message.

Omit any space between words in your message.