Brunel University - Faculty of Technology and Information Systems
Department of Electronic & Computer Engineering

Electronic, Electrical & Microprocessor Applications (EE2082A)

Problem Sheet *(Dr M. K. Darwish)*

1) State the functions of: CPU, Registers, ALU and Control unit. Give examples of the registers used in a typical microprocessor system.

2) State the function of the memory unit in a typical microprocessor system. Also discuss the different types of memory.

3) Discuss the applications of address, data and control buses.

4) Explain the applications of I/O unit, Interrupt and DMA.

5) The following concepts have been introduced in this course. Try to write a brief description of each one.
Machine code; hexadecimal code; assembly language and high-level language. What are the advantages and disadvantages of assembly language in comparison with high-level language?

6) Write an 8085 assembly language programme, which adds the contents of memory location 0800 to the contents of memory location 0801 and stores the result in memory location 0802.

7) Write an 8085 assembly language programme, which adds two three-byte numbers. The first number is stored in memory locations 0800, 0801 & 0802 and the second number is stored in memory location 0803, 0804 & 0805 Store the answer in memory locations 0810 upwards.

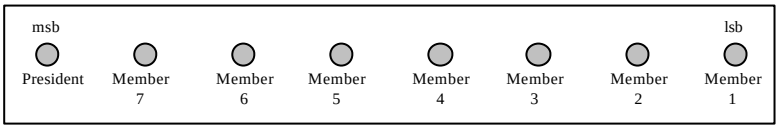
8) Write an 8085 assembly language programme, which masks the least significant 4 bits of the number in memory location 0800 and the least significant 4 bits of the number in memory location 0801. Add the two numbers together and store the result in memory locations 0810 upwards.

9) Write an 8085 assembly language programme, which checks the number in memory location 0800. If the number is an even number, then put 'FF' in memory location 0810, otherwise put '00'.

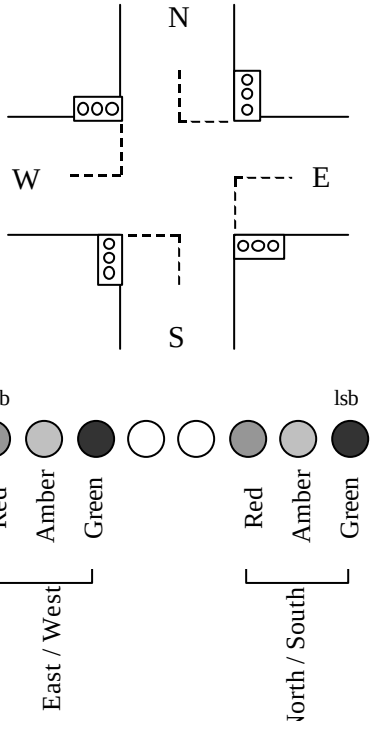
10) The temperatures of two furnaces are being monitored by a microcomputer. A set of five readings of the first furnace, recorded by five thermal sensors, is stored at the memory location starting at 0800 upwards. A corresponding set of five readings from the second furnace is stored at the memory location starting at 0810upwards. Each reading from the first set is expected to be higher than the corresponding reading from

the second set. For example, the temperature reading at the location 0804 (T_{04}) is expected to be higher than the temperature reading at the location 0814 (T_{14}). Write a programme in 8085 assembly language to check whether each reading from the first set is higher than the corresponding reading from the second set. If all readings from the first set are higher than the corresponding reading from the second set, send 01 to memory location 0850. If any one of the readings of the first set is lower than the corresponding reading of the second set, stop the process and send 'FF' to memory location 0850 as an emergency signal.

11) A panel of 8 people (1 president and seven members) has asked you to design an assembly language software for a voting system. The program should send FF to port 11 if there is a majority agreement and 00 to port 11 if there is a majority disagreement. In the case of 50% split in the votes, the president's vote will be decisive. The votes were taken from port 12 as shown below:



12) The sequence of the lights in a traffic-lights controller in U.K. is: red; red and amber together; green; amber; red again; etc.
The controlled road junction is shown in the figure below. It comprises the four roads labelled North, South, East and West and a set of traffic lights at each corner (RAG). The two sets of lights seen by traffic approaching the junction from the North and South change in the same sequence. Similarly, the two sets seen by traffic approaching from East and West also change in the same sequence. The sequence the controller must implement is shown in the figure below. Note that two different delay times are used during the complete cycle.
Design a suitable 8085 assembly language program for this purpose.
(Assume that the frequency of the 8085 microprocessor is 2 MHz)



	North / South			East / West		
	Red	Amber	Green	Red	Amber	
		Green				
Delay	ON	OFF	OFF	OFF	OFF	ON
Delay	ON	OFF	OFF	OFF	ON	OFF
Delay	ON	OFF	OFF	ON	OFF	OFF
Delay	ON	ON	OFF	ON	OFF	OFF
Delay	OFF	OFF	ON	ON	OFF	OFF
Delay	OFF	ON	OFF	ON	OFF	OFF

Delay

Delay 1 = long delay between overall direction changes (15 secs)

Delay 2 = short delay between transitional light settings (1 secs)

13) In an 8-bit binary weighted resistance digital-to-analog converter the value of the resistor in the msb position is 10KΩ and V_{ref} = +10V. Determine the total current for:
   (i) the msb input = 1
   (ii) the lsb input = 1
   (iii) both the msb and the lsb inputs at logic 1.
   (iv) Calculate the maximum current which can be obtained from the above digital-to-analog converter.

14) Graphically show how analog-to-digital conversion by successive approximation is performed for an analog input signal of +4.4V for a full-scale range of 0 to +8V using the sequencing method and a register of 8 bits for storing the digitized value.