4 bits Microcontroller

Questions and Answers

***Question***
Answer

1 ***Q:*** ***Is there an instruction to rotate left a register through carry ?***

A: The 4 bits uC does not provide an instruction to rotate left a register through carry. You have to write a small line of code that emulates this function.
See Application Note # 1: *How to rotate left a register through carry.*

2 ***Q:*** ***Is there an instruction to rotate right a register through carry?***

A: The 4 bits uC does not provide an instruction to rotate right a register through carry. You have to write a small piece of code that emulates this function.
See Application Note # 2: *How to rotate right a register through carry.*

3 ***Q:*** ***Is there an instruction to increment or decrement the index register ?***

A: The 4 bits uC does not provide an instruction to increment or decrement the index register. You have to write a small piece of code that emulates this function.
See Application Note # 3: *How to increment or decrement the index register.*

4 ***Q:*** ***How does one rotate left a large buffer in RAM ?***

A: The 4 bits uC does not provide an instruction to rotate left a large buffer in RAM. You have to write a piece of code to perform this operation.
See Application Note # 4: *How to rotate left a large buffer in RAM.*

The program sample described in that application note uses subroutines described in Application Note # 1: *How to rotate left a register through carry*, and Application Note # 3: *How to increment or decrement the index register.*

5 ***Q:*** ***The specification of the instruction set is not clear about how the carry flag is processed by the ADD, SUB and shift instructions. Are these instructions performed with or without carry ?***

A: The ADD, SUB and shift instructions are performed without carry. However, they either set or clear the carry flag depending on the result of the operation.
See Application Note # 5: *How ADD, SUB and shift instructions handle the carry flag.*

For details about the instruction set please consult the Development System *Manual*, which is available now. This manual contains a formal description of the instruction set.

6 ***Q:*** ***Is there an instruction to read a ROM table ?***

A: The 4 bits uC does not provide an instruction to read a ROM table. You have to write some code that emulates this function.
See Application Note # 6: *Creating data tables in ROM.*

#	Question Answer

7 ***Q:*** ***Is there an instruction to create tables ?***

A: The 4 bits uC does not provide an instruction to create tables. You have to write some code that emulates this function.
See Application Note # 6: *Creating data tables in ROM.*

8 ***Q:*** ***Is it possible to modify the PC register (program counter) with an instruction of the instruction set ?***

A: The 4 bits uC does not provide an instruction to modify the PC register. This topic is related to *N-way branching* and *Indirect addressing* which can be done by writing some code. See Application Note # 7: *How to implement N-way branching.*

9 ***Q:*** ***Is it possible to jump relative to the accumulator in few instructions?***

A: This topic is related to *N-way branching* and *Indirect addressing* which can be done by writing some code, that provides the functionality of relative jumps.
See Application Note # 7: *How to implement N-way branching.*

Other table lookup algorithms that may be used for N-way branching are described in Application Note # 6: *Creating data tables in ROM.*

10 ***Q:*** ***Is it possible to put a jump table in ROM ?***

A: This topic is related to *N-way branching* and *Indirect addressing* which can be done by writing some code, that provides the functionality of a jump table.
See Application Note # 7: *How to implement N-way branching.*

Other table lookup algorithms that may be used for N-way branching are described in Application Note # 6: *Creating data tables in ROM.*

11 ***Q:*** ***The specification of the instruction set is not clear about immediate ALU operations. Is there a better explanation ?***

A: See Application Note # 8: *Immediate ALU Instructions.*

12 ***Q:*** ***Is there an instruction to increment or decrement the accumulator ?***

A: The 4 bits uC provides several instructions to increment or decrement registers. If you want to increment or decrement the accumulator you have to write some very small code that emulates these functions.
See Application Note # 9: *How to increment the accumulator.*

#	Question Answer

13 ***Q:*** ***Is the rate at which instructions are executed 1/4 of the clock frequency ?***

A: No. The rate at which the 4 bits uC executes instructions is 1/2 of the clock frequency.
See Application Note # 10: *Instruction timing.*

14 ***Q:*** ***Are all instructions executed within one instruction cycle ?***

A: Yes. The 4 bits uC executes all instructions within one instruction cycle.
See Application Note # 10: *Instruction timing.*

15 ***Q:*** ***Are the Jump instructions executed within one instruction cycle ?***

A: Yes. The 4 bits uC executes all instructions within one instruction cycle, including the Jump instructions.
See Application Note # 10: *Instruction timing.*

16 ***Q:*** ***Is there an efficient software solution for the 4 bits uC to perform recursive calculations with lookup tables ?***

A: Recursive calculations can be performed very efficiently by the 4 bits uC. However, the 4 bits uC does not provide an instruction to read ROM tables. So you have to write some code that emulates this function. Sometimes it is more efficient to substitute the functionality of recursive calculations with lookup tables by other approaches, for example by using polynomic functions.
See Application Note #11: *Recursive calculation with lookup tables.*
Details about programming with lookup tables are described in
Application Note # 6: *Creating data tables in ROM.*

17 ***Q:*** ***The instruction set of the 4 bits uC is smaller than that of conventional another processors. Does this mean that a 4 bits uC program will require more instructions than an equivalent another program ?***

A: The 4 bits uC instruction set is small but powerful. It is important to design an application program in such a way that it makes full use of the 4 bits uC architecture. In a sample clock program that previously was implemented on an another traditional processor the 4 bits uC program size was only 80% of the orignal program.

Details of this sample program and 4 bits uC programming hints can be found in
Application Note #12: *Memory Requirements for Clock Applications.*

18 ***Q:*** ***Is it possible to perform 16bit multiplication and division.?***

A: The 4 bits uC cannot directly perform 16bit multiplication and division. Consequently, it must be implemented as a software subroutine. Sample programs can be found in
- Application Note #13: *16 bit binary division with 4 bit controller* and
- Application Note #14: *16 bit binary multiplication with 4 bit controller*.

#	Question Answer

19 ***Q:*** ***Is it possible to connect a keyboard with 16 touch on only two ports ?***

A: Yes. You can use a keyboard matrix with a input port and a output port. You must create a multiplex software for read the value four touch at the time.
See Application Note #15: *How to implement a keyboard matrix 4x4*.

20 ***Q:*** ***The install procedure of the Development System start on an error, how install the program ?***

A: The problem is then the windows isn't installed in the default repertory.
See Application Note #16: *Installation of the Development System*.

21 ***Q:*** ***Is it possible use a standard port in ADC mode ?***

A: Yes. You can use a standard port in ADC mode with a few external components and software.
See:
- Application Note #17: *ADC application with EM6X20, ex.: temp measure.*
- Application Note #18: *Ohmmeter application with EM6x20*.

22 ***Q:*** ***Is it possible to convert a hexadecimal number to decimal number?***

A: The 4 bits uC cannot directly perform to convert hex – dec. Consequently, it must be implemented as a software subroutine. Sample programs can be found in Application Note #20: *How to convert Hex – Dec*.

23 ***Q:*** ***Is it possible to convert a decimal number to hexadecimal number?***

A: The 4 bits uC cannot directly perform to convert dec – hex. Consequently, it must be implemented as a software subroutine. Sample programs can be found in Application Note #21: *How to convert Dec – Hex*.