Signal Processors

Questions for examination

Module 1: Introduction to the DSP and preview the TMS320 processors family

1. What are the typical DSP algorithms?
2. Why use digital signal processors?
3. When we can not use the DSP processors in application?
4. Write the list of differences between fixed point and floating point DSP's!
5. Write the list of different TMS320 families and briefly specify areas what they are designed for!

Module 2: TMS320C6000 Architectural Overview

1. What is the functional unit of the C6711 CPU, what functional unit can perform an ADD and which functional unit support memory loads and stores?
2. Describe the register files in C6711 (which registers can be used as conditional registers, registers for circular addressing and temporary registers)?
3. Which instructions can be conditional?
4. Define the execute packet of instructions and describe the pipelining!
5. Briefly describe the memory map of C6711 DSP!
6. What is the C6711 instruction cycle time and what is the performance of C6711 (in MIPS)?
7. Draw the functional block diagram of C6711!
8. What are cross-paths and what types of cross-paths are implemented in C6711?
9. Write the list of addressing modes which are available in C6711!
10. Define the assembly code format!
11. Write the types of instructions!
12. What are the assembler directives?
13. What is the linear assembler?
14. Write the four commonly used data formats and their range.
15. Define the standard IEEE floating point representation of numbers!

Module 3: Code Composer Studio and the DSK 6711

1. Briefly describe capabilities of the Code Composer Studio!
2. Briefly describe the hardware of the DSK 6711!
3. What type of connections to the host DSK supports?

Module 4: Numerical Issues

1. What two problems arise when using signed and unsigned integers. How they can be solved?
2. Define and describe fractional binary number and sign extension!
3. Define and describe Q format!
4. Define and describe floating point arithmetic (IEEE Standard)!

Module 5: Linear Assembler

1. What does mean a linear assembler (LA) and how it can be used in optimization process?
2. How can be code written in LA?
3. Describe passing and returning arguments in LA!
4. Describe declaring the symbolic variables!
5. Describe function calls in LA!

Module 6: Interfacing C and Assembly Code

1. Describe how to interface C and ASM code and how to use intrinsics!
2. Describe passing arguments between C and ASM!

Module 7: Enhanced Direct Memory Access (EDMA)

1. What two methods for transferring data from one part of the memory to another are available in C6711? Which method is the better?
2. What is the function of EDMA controller?
3. Write the EDMA features!
4. Write the EDMA parameters!
5. What two methods for initiating a transfer are available in EDMA?

Module 8: Multi-channel Buffered Serial Port (McBSP)

1. Define the terms: bit, word, channel, frame and phase in terms of serial port.
2. Draw the functional block diagram of McBSP!
3. What registers are using by the McBSP?
4. How we can determine the status of McBSP?
5. What interrupts are generated by the McBSP?

Module 9: External Memory Interface (EMIF)

1. What is the EMIF and why we need it?
2. Write the list of different types of memories supported by EMIF!
3. Write important EMIF features!
4. What is need to be configured when interfacing the DSP to an external device using the EMIF

Module 10: Interrupts

1. What is the interrupt in terms of processors?
2. Write the list of interrupts in C6711!
3. What is the interrupt priority?
4. What is the interrupt vector and vector table?
5. What is reset and NMI, is it possible to mask them?
6. What is Interrupt Flag Register (IFR)?

Module 11: Finite Impulse Response Filter

1. Describe the FIR filter, write the transfer function of the FIR filter!
2. Draw the FIR filter structure!
3. What is the impulse response of FIR?
4. Frequency Response of an FIR Filter.
5. Phase Linearity of an FIR Filter.

Module 12: Infinite Impulse Response Filter

1. Describe the IIR filter, write the transfer function of the IIR filter!
2. Draw the IIR filter direct form I. and direct form II. structure!
3. Write features of IIR filters!

Module 13: Adaptive Filters

1. Define and describe a basic block diagram of adaptive filter!
2. Describe the LMS update algorithm!

Module 14: Fast Fourier Transform (FFT)

1. Define the Discrete Fourier Transform (DFT)!
2. What is the "twiddle factors"?
3. How many complex multiplications and complex additions is required by the DFT algorithm?
4. Prove following formulas:

$$W^{k+N} = W^{k}, \quad (1)$$

$$W^{k+N/2} = -W^{k}, \quad (2)$$

$$W^{kN/2} = (-1)^{k}. \quad (3)$$

5. Define the Fast Fourier Transform (FFT)!