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06EC74

Seventh Semester B.E. Degree Examination, June/July 2014
DSP Algorithms and Architecture

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions, selecting atleast TWO questions from each part.***

PART – A

1 a. Explain a digital signal processing system with the help of a block diagram. **(08 Marks)**

b. $x(n) = (3, 2, 2, 4, 1, 0, -3, -2, -1, 0, 2, 3\}$ be decimated by a factor of 2. If the filter coefficients $b_k = \left\{\frac{1}{3}, \frac{2}{3}, 1, \frac{2}{3}, \frac{1}{3}\right\}$. Obtain the decimated sequence. **(08 Marks)**

c. For the IIR filter $y(n) = 0.9y(n-1) + 0.1x(n)$ find the transfer function. Draw the block diagram, magnitude response, phase frequency response. **(04 Marks)**

2 a. With a neat block diagram, explain the function of address generation unit of DSP processor. **(08 Marks)**

b. i) What are the memory address of the operation in each of the following cases of indirect addressing modes? In each case, what will be the content of the addr reg after the memory access? Assume that initial contents of the addr reg and the offset reg are 0200h and 0010h respectively:

I. ADD * addr reg - ,
II. ADD + * addr reg
III. ADD offset reg +, * addr reg
IV. ADD* addr reg, offset reg.

ii) A DSP has a circular buffer with the start and the end address as 0200h and 020Fh respectively. What would be the new values of the addresses pointer of the buffer if, in the course of address computation, it gas updated to i) 0212h; ii) 01FCh?

iii) Explain the purpose of program sequences. **(12 Marks)**

3 a. Describe the following of the TMS 320C54xx processor:
i) Multiply/Address (MAC) unit ; ii) Direct addressing mode. **(10 Marks)**

b. Explain PMST registers. **(10 Marks)**

4 a. Describe the operation of the following MPY instruction:

i) MPY # 01234, A
ii) MPY * AR2 - , * AR4 + 0, B
iii) MAC * AR5 +, # 1234h, A
iv) MAC * AR3 -, * AR4+, B, A. **(08 Marks)**

b. Write a program to find the sum of a series of signed numbers stored at successive locations in the data memory and place the result in the accumulator A

$$A = \sum_{i=410h}^{41Fh} d\ mad(i).$$ **(08 Marks)**

c. Explain the following assembler directives:
i) .mmregs; ii) .global; iii) .end; iv) .data **(04 Marks)**

PART – B

5 a. What is the significance of Q-notation in DSP? Write a program for the multiplication of two Q15 number to produce Q15 number result. **(10 Marks)**

b. Explain with the help of block diagram and mathematical equation, the implementation of a second order IIR filter. **(10 Marks)**

6 a. With necessary equation, explain how basic DIT-FFT butterfly in-place computation is implemented in C54xx DSP. **(10 Marks)**

b. Determine the following for a 128 point FFT computation:
   i) Number of stage.
   ii) Number of butterfly in each stage.
   iii) Number of butterfly needed for the engine computation.
   iv) Number of butterflies that needed on multiplication. **(04 Marks)**

c. Explain how scaling prevents overflow conditions in the butterfly computation. **(06 Marks)**

7 a. What is parallel I/O interface? With a neat timing diagram explain the operation. **(10 Marks)**

b. What is an interrupt? With a neat flow chart, explain the response of C54xx to an interrupt. **(10 Marks)**

8 a. With a neat block diagram, explain the functioning of a multichannel buffered serial port. **(10 Marks)**

b. Explain IPEG encoding and decoding with the help of block diagram. **(10 Marks)**

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