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10EC751

Seventh Semester B.E. Degree Examination, Dec.2016/Jan.2017
DSP Algorithms and Architecture

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. An analog signal is sampled at the rate of 8KHz. If 512 samples of this signal are used to compute DFT x(k), determine analog and digital frequency spacing between adjacent x(k) elements. Also, determine analog and digital frequencies corresponding to k = 64. **(06 Marks)**

b. With a neat block diagram, explain scheme of a DSP system. **(08 Marks)**

c. Let x[n] = [3, 2, -2, 0, 7]. It is interpolated using an interpolation filter b_k = [0.5, 1, 0.5] with interpolation factor 2. Determine the interpolated sequence. **(06 Marks)**

2 a. With a neat block diagram, explain arithmetic logic unit (ALU) of a DSP system. **(06 Marks)**

b. Explain the operation of barrel shifter, with an example. **(05 Marks)**

c. Explain : i) circular addressing mode ii) parallelism iii) Guard bits. **(09 Marks)**

3 a. Explain functional architecture of TMS320C54XX processor, with a block diagram. **(10 Marks)**

b. Explain the addressing modes of TMS320C54XX processor. Give examples. **(10 Marks)**

4 a. Explain the following assembler directives of TMS320C54XX processors.
i) ·mmregs ii) ·global iii) ·include'xx' iv) ·data v) ·end vi) ·bss **(06 Marks)**

b. Describe Host port interface and explain its signals. **(06 Marks)**

c. Write an assembly language program of TMS320C54XX processors to compute the sum of three product terms given by the equation, $y(n) = h_0\, x(n) + h_1\, x(n-1) + h_2\, x(n-2)$ with usual notations. Find y(n) for signed 16 bit data samples and16 bit constants. **(08 Marks)**

PART – B

5 a. Determine the value of each of the following 16-bit numbers represented using the given Q-notations: i) 4400h as a Q0 number ii) 4400h as a Q7 number iii) ·3125 as a Q15 number iv) –·3125 as a Q15 number. **(06 Marks)**

b. Write an assembly language program for TMS320C54XX processors to multiply two Q15 numbers to produce Q15 number result. **(06 Marks)**

c. What is an interpolation filter? Explain the implementation of digital interpolation using FIR filter and polyphase subfilter. **(08 Marks)**

6 a. Write a TMS320C54XX program that illustrates the implementation of 8-point DIT FFT algorithm. **(12 Marks)**

b. Briefly explain scaling and derive the expression for optimum scaling factor for DIT FFT Butterfly algorithm. **(08 Marks)**

7 a. With a neat schematic diagram, design a data memory system with address range 000800h – 000FFFH for a C5416 processor. Use 2K×8 SRAM memory chips. **(08 Marks)**

b. Explain how the interrupts are handled in TMS320C54XX processor, with the help of a flow chart. **(08 Marks)**

c. Explain briefly memory space organization in TMS320C54XX memory. **(04 Marks)**

8 a. Explain PCM3002 CODEC, with the help of a neat block diagram. **(06 Marks)**

b. Explain DSP-based biotelemetry receiver system, with the help of a block schematic diagram. **(06 Marks)**

c. With the help of a block diagram, explain the image compression and reconstruction using JPEG encoder and decoder. **(08 Marks)**

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