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10EC751

Seventh Semester B.E. Degree Examination, June/July 2018
DSP Algorithms and Architecture

Time: 3 hrs.

Max. Marks:100

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

PART – A

1 a. Explain digital signal processing with a neat block diagram. **(04 Marks)**

   b. Explain discrete time sequence in detail. Determine the periods for the periodic sequences ,
      (i) $e^{-\frac{jn\pi}{8}}$ (ii) $e^{-\frac{jn3\pi}{8}}$ **(08 Marks)**

   c. Mention the difference between FIR and IIR filters. Find the magnitude and phase response of an FIR filter represented by the difference equation, $y(n) = 0.5x(n) - 0.5x(n-1)$ **(08 Marks)**

2 a. How does the barrel shifter in a DSP works? Explain with an example. **(06 Marks)**

   b. With a neat block diagram, explain the working of MAC unit. **(06 Marks)**

   c. Explain the bit reversed addressing mode for a 16 point FFT with a neat diagram and step by step generation of binary code. **(08 Marks)**

3 a. Compare architectural features of TMS320C25, DSP56000 and ADSP2100 fixed point DSP. **(06 Marks)**

   b. Explain any five addressing modes of TMS320C54XX with one example each. **(10 Marks)**

   c. Identify the addressing modes of the source operand in each of the following instructions:
      (i) ADD, *AR2+OB, A   (ii) ADD *AR2+, A   (iii) ADD *AR2+%, A   (iv) ADD #23h, A **(04 Marks)**

4 a. Explain the following assembler directives of TMS320 DSP processor :
      (i) .mmregs   (ii) .data   (iii) .text   (iv) .bss **(04 Marks)**

   b. Write a program to find the sum of series of signed number from address 410H to 41FH given by $A = \sum dmad$. **(08 Marks)**

   c. Explain with one example each the four types of classifications of assembly language instructions of TMS320 DSP processor. **(08 Marks)**

PART – B

5 a. Determine the values respresented by the 16 bit fixed point number N_1 = 4D00 and N_2 = CDCAH in Q7 and Q15 notation. **(04 Marks)**

   b. Write an ALP for the FIR filter with 200 input samples using 16 length circular buffers for the TMS320 DSP. **(10 Marks)**

   c. Write an ALP to multiply two Q15 numbers to produce a Q15 result for the TMS320 DSP. **(06 Marks)**

6 a. Explain scaling operation in DSP processor and derive the expression for optimal scaling factor for DIT FFT butterfly algorithm. **(08 Marks)**

   b. Write a pseudo code to determine 8 point DFT using DIT FFT algorithm invoking butterfly subroutine in a nested loop for each stage. **(12 Marks)**

7 a. Explain the working of DMA with respect to the TMS320 DSP processor. **(08 Marks)**

   b. Explain the working of interrupts in TMS320 DSP. **(08 Marks)**

   c. Explain the memory space organization of TMS32054XX DSP. **(04 Marks)**

8 a. Explain the working of PMC 3002 CODEC with neat block diagram. A PMC 3002 is programmed for 12 kHz sampling rate, determine the divisor N to be written to the CPLD of the DSK and various clock frequencies. **(08 Marks)**

   b. Explain the biotelemetry receiver system with the help of a block diagram. **(06 Marks)**

   c. Explain with a block diagram clipping auto correlation speech detector. **(06 Marks)**

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