



P.E.S. College of Engineering, Mandya - 571 401

(An Autonomous Institution affiliated to VTU, Belagavi)

Fifth Semester, B.E. - Electronics and Communication Engineering

Semester End Examination; Dec. - 2019

Digital Signal Processors and Application

Time: 3 hrs

Max. Marks: 100

Note: Answer FIVE full questions, selecting ONE full question from each unit.

UNIT - I

- 1 a. Explain the basic features that should be provided in the DSP architecture to be used to implement the following N^{th} order FIR filter: 8
- $$y(n) = \sum_{i=0}^{N-1} h(i)x(n-i) \quad ; \quad n = 0, 1, 2, \dots$$
- b. With relevant block diagram, explain the various features of ALU of DSP processor. 8
- c. Write a short note on, On-chip memory. 4
- 2 a. Identify the addressing modes of the operands and explain their operation: 6
- i) ADD reg ii) ADD mem iii) ADD offset reg -, * addrreg
- iv) ADD - * addrreg v) ADD * addrreg + vi) ADD * addrreg, offsetreg +
- b. Explain circular and bit reserved addressing modes. 8
- c. Write a note on parallelism in DSP architecture. 6

UNIT - II

- 3 a. Draw the memory map for the TMS320C54X processor and explain processor bit for configuring the on-chip memories. 8
- b. Draw the functional diagram of the barrel shifter of TMS320C54XX processor and explain the significance of each block. 8
- c. Explain program control unit of TMS320C54XX processor. 4
- 4 a. Assuming the current content of AR3 to be 200 h, what will be its contents after each of the following TMS320C54XX addressing modes is used. Assume that the content of AR0 is 20 h: 4
- i) *AR3-0 ii) *AR3+ iii) *+AR3(40h) iv) *AR3-
- b. With suitable diagrams, explain direct addressing and indirect addressing mode of TMS320C54XX. 10
- c. With neat block diagram, explain timer circuit. 6

UNIT - III

- 5 a. Describe the importance of Q-notation in DSP algorithm implementation with examples. What are the values represented by 16-bit fixed point number $N = 400$ h in Q15, Q10, Q7 notations? 10
- b. Explain how the FIR filter algorithm can be implemented using TMS32054XX processor? 10

- 6 a. Write subroutine for bit reverse address generation and explain the same. 6
- b. Explain the butterfly computation in DIT-FFT algorithm and write a subroutine that implement the butterfly computation. 10
- c. Determine the following for a 128-point FFT computation:
- i) Number of stages
 - ii) Number of butterflies in each stage 4
 - iii) Number of butterflies needed for the entire computation
 - iv) Number of butterflies that need no twiddle factor

UNIT – IV

- 7 a. Draw the timing diagram of the memory interface signal for a read-read-write sequence of operation. Also explain the purpose of each signal. 6
- b. Draw and explain the I/O interface timing diagram for read-write-read sequence of operation. 6
- c. Explain the interface between an A/D converter and DSP processor in the programmed I/O mode with a diagram and flowchart. 8
- 8 a. With a neat flowchart, explain handling of interrupt by TMS320C54XX processor. 8
- b. Draw and explain Synchronous Serial Interface (SSI) between the C54XX and a CODEC device. 6
- c. Explain register sub addressing technique for configuring DMA operation. 6

UNIT - V

- 9 a. With the help of block diagram, explain the clipping autocorrelation pitch detector. 10
- b. Draw and explain Biotelemetry transmitter and biotelemetry receiver. 10
- 10 a. Enlist the salient feature of TMS320C6713 processor. 6
- b. Explain the image compression and reconstruction using JPEG encoder and decoder. 8
- c. Draw and explain block diagram of a hard disk drive servo control system. 6

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