

IV B.Tech II Semester Regular/Supplementary Examinations, April - 2018

**DIGITAL SIGNAL PROCESSING**

(Electrical and Electronics Engineering)

Time: 3 hours

Max. Marks: 70

*Question paper consists of Part-A and Part-B**Answer ALL sub questions from Part-A**Answer any THREE questions from Part-B*

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**PART-A (22 Marks)**

1. a) Determine the range of values of “P” and “q” for the stability of LTI system with impulse response  $h(n)=p^n; n<0$   
 $=q^n; n\geq 0$  [4]
- b) Discuss the periodicity and linearity property of DFT. [4]
- c) Explain the need for going to FFT rather than DFT. [3]
- d) What is the drawback in FIR filter design using windows and frequency sampling method? How is it overcome? [4]
- e) Consider the discrete time signal  $x(n)=\{1,2,3,4\}$  determine the up sampled version of the signals for the sampling rate multiplication factor i) I=2 ii) I=3. [4]
- f) Explain the concept of pipelining and mention its importance in DSP processors. [3]

**PART-B (3x16 = 48 Marks)**

2. a) Test the following system for linearity

$$y(n) = \sum_{m=0}^M b_m x(n-m) - \sum_{m=1}^N c_m y(n-m) \quad [6]$$

- b) Find the system response of the following difference equation  $y(n) - \frac{7}{12}y(n-1) + \frac{1}{12}y(n-2) = 2$  for  $n \geq 0$ , when signal  $x(n)=2u(n)$  assume initial conditions are  $y(-1)=2$  and  $y(-2)=3$ . [10]
3. a) Explain the need of zero padding in DFT Sequence. Compute the 8-point of DFT of the following sequence  $x(n)=\{1,1,1,1,0,0,0,0\}$ . [8]
- b) Compute circular convolution of the following two sequences using DFT.  
 $x_1(n)=\{0,1,0,1\}$  and  $x_2(n)=\{1,2,1,2\}$ . [8]
4. a) Find the inverse FFT of the given  $X(k)=\{1,2,3,4\}$  using DIF algorithm. [8]
- b) Compute the 8-point DFT of the sequence  $x(n)=\cos(n\pi/2)$  using the DIT-FFT algorithm. Show all intermediate results. [8]
5. a) Show that decimator and interpolator are time-invariant systems. [8]
- b) Discuss the sampling rate conversion by a rational factor I/D. [8]

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**R13**

**Set No. 1**

6. a) Design a linear phase FIR low pass filter using rectangular window by taking 7 samples of window sequence and with cutoff frequency  $\omega_c=0.2\pi$  rad/sample. [8]
- b) Derive the relation between analog and digital filter poles in impulse invariant transformation method. [8]
7. a) Explain with neat sketch the Architecture of TMS 320C5X. [10]
- b) Write any four special instructions of TMS320C5X processors that are suitable for signal processing applications and explain. [6]

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