Code No: **RT42023B** **R13** **Set No. 1**

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