

IV B.Tech I Semester Regular/Supplementary Examinations, October/November - 2017  
**DIGITAL SIGNAL PROCESSING**  
 (Electronics and Computer 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) Verify the system having impulse response,  $h(n) = \left(\frac{1}{3}\right)^n u(n)$  is stable or not? [4]
- b) What are the advantages of FFT over DFT? [3]
- c) Distinguish the canonical and non-canonic structures? [4]
- d) List out the characteristics of Chebyshev filters? [3]
- e) What is the need for multirate signal processing? [4]
- f) What is meant by circular addressing mode? [4]

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

2. a) Explain the classification of discrete time systems with an example? [8]
- b) Determine the response  $y(n), n \geq 0$ , of the system described by the second order difference equation  $y(n) - 3y(n-1) - 4y(n-2) = x(n) + 2x(n-1)$ . when the input sequence  $x(n) = 4^n u(n)$ . [8]
3. a) Compute the linear convolution of the following sequences using DFT  $x(n) = \{1, 4, -1, 2\}; h(n) = \{-1, 0, 3\}$ . [8]
- b) Compute 8-point DFT of the sequence  $x(n) = \begin{cases} 1, & 0 \leq n \leq 7 \\ 0, & \text{otherwise} \end{cases}$  by using DIF FFT algorithm? [8]
4. a) Find the inverse Z transform of 
$$X(z) = \frac{z^{-1}}{3 - 4z^{-1} + z^{-2}}; \quad \text{ROC: } |Z| > 1$$
 [8]
- b) With neat sketches, Explain the basic structures of FIR systems. [8]
5. a) Compare the various window techniques of FIR filter in terms of side lobe and bandwidth? [8]
- b) Design a Digital Butterworth filter that satisfies the following constraints using Impulse invariant transformation. Assume  $T=1$ sec. 
$$\begin{aligned} \sqrt{0.5} \leq |H(e^{j\omega})| \leq 1 & \quad 0 \leq \omega \leq \frac{\pi}{2} \\ |H(e^{j\omega})| \leq 0.2 & \quad \frac{3\pi}{4} \leq \omega \leq \pi \end{aligned}$$
 [8]
6. a) Explain the significance of sampling rate conversion. What are the different applications of multirate digital signal processing? [8]
- b) With neat sketch, explain about decimation. Draw its frequency spectrum. [8]
7. a) Draw and explain the internal architecture of TMS320C5X? [8]
- b) Explain how convolution is performed using a single MAC unit? [8]