

Code No: 56027

R09

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech III Year II Semester Examinations, May - 2016

DIGITAL SIGNAL PROCESSING

(Electronics and Communication Engineering)

Time: 3 hours

Max. Marks: 75

Answer any five questions  
All questions carry equal marks

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- 1.a) Determine whether the following systems are: Memoryless, Stable, Causal, Linear, Time-invariant.  
i)  $y(n) = nx(n)$   
ii)  $y(t) = e^{x(t)}$
- b) Find the response of the system for the input signal  
 $x(n) = \{1, 2, 2, 3\}$  and  $h(n) = \{1, 0, 3, 2\}$  [8+7]
2. Using linear convolution find  $y(n) = x(n)*h(n)$  for the sequences  $x(n) = (1, 2, -1, 2, 3, -2, -3, -1, 1, 1, 2, -1)$  and  $h(n) = (1, 2)$ . Compare the result by solving the problem using  
a) Over-lap save method and b) Overlap – add method. [7+8]
3. Describe the decimation in time [DIT] radix-2 FFT algorithm to determine N-point DFT. [15]
- 4.a) Design a digital filter using  $H(S) = \frac{1}{S^2 + 9S + 18}$  with  $T = 0.2$  sec.  
b) Define Z-Transform and List out its properties. [10+5]
5. Determine the system function  $H(z)$  of the Chebyshev's low pass digital filter with the following specifications using bilinear transformation (assume  $T = 1$  sec)  
 $\alpha_p = 1$  dB ripple in the pass band  $0 \leq \omega \leq 0.2\pi$   
 $\alpha_s = 15$  dB ripple in the stop band  $0.3\pi \leq \omega \leq \pi$  [15]
- 6.a) Design an FIR Digital Low pass filter using rectangular window whose cut off freq is 2 rad/s and length of window  $N = 9$ .  
b) Derive the conditions to achieve Linear Phase characteristics of FIR filters. [10+5]
- 7.a) Implement the decimation in time FFT algorithm for  $N = 16$ .  
b) Explain in detail about interpolation and decimation. [8+7]
- 8.a) Discuss in detail the errors resulting from rounding and truncation.  
b) If  $x(n)$  denotes a finite length sequence of length  $N$ , show that  $x((-n))_N = x((N - n))_N$  [7+8]

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