

Roll No.

Total No. of Pages : 02

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M.Tech. (EE) (2018 Batch) (Sem.-2)
ADVANCED DIGITAL SIGNAL PROCESSING
Subject Code : MTEE-203B-18
M.Code : 76103

Time : 3 Hrs.

Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. Attempt any FIVE questions out of EIGHT questions.
2. Each question carries TWELVE marks.

1. Determine the correct classification of the system with proper justification
 - a) $y(n) = 2x(n) + 3$ in terms of linear or nonlinear,
 - b) $y(n) = x(n+1) + \frac{x(n)}{x(n-1)}$ in terms of causal or not causal,
 - c) $y(n) = 3nx(n)$ in terms of time variant or time invariant,
 - d) $h(n) = 4^n u(-n)$ in terms of stable or not stable.
2. State the property of differentiation in Z-domain. Also find Z-transform of the sequence $x(n) = (n+0.5)\left(\frac{1}{3}\right)^n u(n)$.
3. Input $x(n) = \{1, 2, 3, 1\}$ and Impulse response $h(n) = \{1, 1, 1\}$ of a LTI system. Determine the response of the system by calculating linear convolution using circular convolution.
4. Design a discrete time Butterworth filter for the following specifications using an impulse invariant method
$$0.8 \leq |H(e^{j\omega})| \leq 1 \quad \text{for} \quad 0 \leq \omega \leq 0.2\pi$$
$$|H(e^{j\omega})| \leq 0.2 \quad \text{for} \quad 0.6\pi \leq \omega \leq \pi.$$
 The sampling frequency is 1Hz.

5. Design a low pass FIR filter with a cutoff frequency of 0.25 kHz and a sampling frequency of 1 kHz using Hanning window. Assume a filter length $N = 11$. Find its windowed causal impulse response sequence and transfer function $H(z)$ of the causal filter.
6. What are overflow oscillations and zero input limit cycle oscillations in IIR filters? Explain each using a suitable example.
7. Describe all poles and all zeros model. Also provide the estimation of power spectrum of stationary random signals.
8. Write short notes on :
 - a) Optimum signal estimation
 - b) Mean square error estimation.

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.