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EX-703 (GS)

B.E. VII Semester

Examination, December 2017

Grading System (GS)

Digital Signal Processing

Time : Three Hours

Maximum Marks : 70

Note: i) Attempt any five questions.

ii) All questions carry equal marks.

1. a) Determine the DTFT of the signal

$$x(n) = a^{|n|} \quad -1 < a < 1$$

b) Determine the general form of the Homogenous solution to the difference equation

$$y[n] - \frac{3}{4}y[n-1] + \frac{1}{8}y[n-2] = 2x[n-1]$$

2. a) State and prove time shifting and frequency shifting properties of DTFT.

b) Prove the final value theorem for the one sided Z-transform.

3. a) Determine Z-transform and sketch the ROC for

$$x(n) = \begin{cases} \left(\frac{1}{3}\right)^n, & n \geq 0 \\ \left(\frac{1}{2}\right)^{-n}, & n < 0 \end{cases}$$

b) Prove the convolution and correlation properties of the Z-transform.

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4. a) Enlist properties of Discrete Fourier Series.

b) Compute the eight point DFT of the sequence

$$x(n) = \begin{cases} 1, & 0 \leq n \leq 7 \\ 0, & \text{otherwise} \end{cases}$$

by using decimation in frequency FFT algorithm.

5. a) Explain the applications of FFT Algorithm.

b) Convert the analog filter with system function

$$H_a(s) = \frac{s+0.1}{(s+0.1)^2+9}$$

into a digital IIR filter by means of the impulse invariance method.

6. a) Determine the order and the poles of a low pass Butterworth filter that has –3dB bandwidth of 500Hz and an attenuation of 40 dB at 1000 Hz.

b) Enlist and explain the characteristic of IIR Digital Filters.

7. a) Determine the cascade and parallel realization for the system described by the system function

$$H(z) = \frac{10\left(1-\frac{1}{2}z^{-1}\right)\left(1-\frac{2}{3}z^{-1}\right)\left(1+2z^{-1}\right)}{\left(1-\frac{3}{4}z^{-1}\right)\left(1-\frac{1}{8}z^{-1}\right)\left[1-\left(\frac{1}{2}+j\frac{1}{2}\right)z^{-1}\right]\left[1-\left(\frac{1}{2}-j\frac{1}{2}\right)z^{-1}\right]}$$

b) Compare IIR and FIR filters.

8. Write short notes on (any two) :

a) Inverse FFT

b) Spectral transformations

c) Design of FIR Digital Filters

d) Realization of FIR Digital Filters.

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