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Question Paper Code : 52393

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2017
Fifth/Seventh Semester
Computer Science and Engineering
CS 2403 – DIGITAL SIGNAL PROCESSING
(Common to Information Technology)
(Regulations 2008)
(Also common to PTCS 2403 – Digital Signal Processing for B.E. (Part-Time) Sixth Semester – CSE – Regulations 2009)

Time : Three Hours | Maximum : 100 Marks

Answer ALL questions

PART – A **(10×2=20 Marks)**

1. The impulse response of a discrete LTI system is given by $h(n)=\left(\frac{1}{3}\right)^n u[n]$. Determine whether the system is stable.
2. Find the z-transform of the signal $x[n]=\{2, 3, \underset{\uparrow}{1}, -2, 0, 1\}$. Also specify its ROC.
3. How many number of complex multiplications and additions are required for computing N-point DFT using DIF FFT algorithm ?
4. Write down the mathematical expressions used for computing DFT and IDFT.
5. Using the bilinear transformation $s=\frac{1-z^{-1}}{1+z^{-1}}$ what is the image of $s=e^{j\pi/2}$ in the z-plane.
6. What are the different methods available for design of IIR filters ?
7. Under what condition an FIR filter will exhibit linear phase response.
8. Draw the direct form I realization given the impulse response h[n] = {2, –2, 3, 4, 5}.
9. Given x[n] = {1, 2, 5, 5, 2, 3, 4, 2} down sample x(n) by a down sampling factor M= 2.
10. State the need for image enhancement.

PART – B **(5×16=80 Marks)**

11. a) i) Given x[n] = {1, 2, 3, 4} and h[n] = {1, 2, 3}. Find the linear convolution, circular convolution and cross correlation of the given sequences. **(9)**

ii) Given the input-output relation of a discrete time system y[n] = 2x[n – 1]. Determine whether it is a linear and time invariant system. **(7)**

(OR)

b) A second order system is represented by the difference equation

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

Find the impulse response h(n) of the system using z-transform.

12. a) Given x[n] = {1, 2, 1, 2, 1, 2, 1, 2} compute DFT using decimation in frequency algorithm.

(OR)

b) State and prove any four properties of DFT.

13. a) Design a digital low pass filter using bilinear transformation to satisfy the following characteristics.

a) Monotonic stop band and pass band.

b) – 2 dB cutoff frequency at 0.3π rad

c) Magnitude down at least 15 dB at 0.8π rad.

(OR)

b) A system is represented by its transfer function H(z)

$$H(z)=\frac{\frac{11}{8}z^{-2}-\frac{21}{4}z^{-1}+7}{\frac{1}{8}z^{-2}-\frac{3}{4}z^{-1}+1}$$

Draw the DFI and DFII realization of the system.

14. a) What are the various errors that occur in digital filter design due to finite register length ?

(OR)

b) Design an FIR filter of order N = 7 with cutoff frequency $\omega_c = \pi/4$ rad, using Hanning window.

15. a) Explain in detail the down sampler both in time and frequency domain with necessary illustrations.

(OR)

b) Write short notes on :

i) Adaptive filters. **(8)**

ii) Histogram processing. **(8)**