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Reg. No. : .....

Name : .....

Seventh Semester B.Tech. Degree Examination, October 2014
(2008 Scheme)
08.703 : DIGITAL SIGNAL PROCESSING (E)

Time : 3 Hours Max. Marks : 100

***Instruction** : Answer **all** questions from Part – **A** and **one full** question from **each** Modules of Part – **B**.*

PART – A

1. What is the relation between bounded sequence and energy of a sequence ? Explain power and energy of a sequence.

2. Check the causality and memory of the system

$$y(n) = x(n) + \frac{1}{x(n-1)}.$$

3. Sketch the discrete sequence described by difference equation

$$x(n) = \delta(n+2) - \delta(n+1) + 2\,\delta(n) + \delta(n-2) - 0.5\,\delta(n-3).$$

4. State and explain Parseval's theorem ? Find energy of sequence $x(n) = \{2, 2, \underset{\uparrow}{2}, 2, 2\}$.

5. Find z-Transform of a general negative time sequences.

6. What is a stable system ? How we can analyse stability of discrete time system ?

7. Find poles and zeros of system described by difference equation

$$y(n) = x(n) + 3x(n-1) + 4y(n-1) - 2y(n-2).$$

8. Explain the need of FFT in detail.

9. Compare Direct form I and Direct form II realization of IIR filters.

10. Explain linear phase realization of FIR filters in detail ? Where it is used ?

(10×4=40 Marks)

P.T.O.

PART – B

Module – I

11. a) With neat block diagram explain the need of Digital signal processing in biomedical application. 8

b) Explain the need of quantization and coding of signals in DSP. 4

c) Check for periodicity, Energy and Power of given signals 8

i) $x(t) = e^{-5t}\, u(t)$

ii) $x(n) = (-0.3)^n\, u(n)$.

12. a) Check for linearity and time invariant for the following systems. 8

i) $y(t) = \log(x(t))$ iii) $y(n) = x(-n)$

ii) $y(n) = A\, x(n) + B$ iv) $y(n) = x(n^2)$.

b) Define DTFT of x(n) and hence find out DTFT of following sequence. Also plot the spectrum.

i) $x(n) = \{2, \underset{\uparrow}{3}, 1, 4\}$

ii) $x(n) = \left\{ \frac{1}{2}, 1, 1 \right\}$

iii) $x(n) = 5(3)^n\, u(-n)$. 12

Module – II

13. a) State and explain initial value and final value theorem with the help of an example. 6

b) Find z-Transform of following sequences

i) $x(n) = 3^{n-1}\, u(n-1)$

ii) $x(n) = 2^n\, u(n) + 3\left[\left(\frac{1}{2}\right)^n u(n)\right]$. 8

c) Obtain the inverse z-Transform of

$$X(z) = \frac{1}{1 - 1.5\, z^{-1} + 0.5 z^{-2}} \quad \text{for ROC } 0.5 < |z| < 1 \text{ and } |z| > 1$$ 6

14. a) Determine the system Transfer function and impulse response of the discrete LTI system described by difference equation

$y(n) = x(n) + 3x(n-1) + 2y(n-1) - y(n-2)$. 10

b) Given $x(n) = \{2, 1, 4, 6, 5, 8, 3, 9\}$

Draw an 8-point radix – 2 DIT FFT flow graph. 10

Module – III

15. a) Realize the system $y(n) = \frac{3}{4}y(n-1) - \frac{1}{8}y(n-2) + x(n) + \frac{1}{3}x(n-1)$ in cascade and parallel form. 12

b) Obtain direct form I and Direct form II realization of the difference equation $y(n) = 0.5\, y(n-1) - 0.25\, y(n-2) + x(n) + 0.4\, x(n-1)$. 8

16. a) Realize the system function with minimum number of multipliers

$$H(z) = \frac{1}{2} + \frac{1}{3}z^{-1} + z^{-2} + \frac{1}{4}z^{-3} + z^{-4} + \frac{1}{3}z^{-5} + \frac{1}{2}z^{-6}.$$ 8

b) Design low pass Butterworth filter using impulse invariant method for satisfying the following constraints. 12

Pass band W_p	=	0.162 rad
Stop band W_s	=	1.63 rad
Pass band ripple	=	3 dB
Stop band attenuation	=	30 dB
Sampling frequency	=	8 KHz
