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Reg. No. : .....

Name : .....

Seventh Semester B.Tech. Degree Examination, November 2015
(2008 Scheme)
08.703 : DIGITAL SIGNAL PROCESSING (E)

Time : 3 Hours Max. Marks : 100

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

PART – A

1. Discuss the steps involved in creating digital signal from given analog signals with the help of neat sketch.
2. What is the need of processing of signals ? In telephony system which processing method is utilised ?
3. Define periodic and aperiodic signals and hence explain how spectrum of these signals can be obtained.
4. Define DTFT of a sequence x(n). Show that DTFT of an aperiodic sequence is periodic with period 2π.
5. What is ROC in a z-plane ? Discuss ROC of finite duration signals.
6. Find z-Transform of $x(n) = na^n u(n)$.
7. Distinguish between decimentation in time and decimentation in frequency algorithms of FFT.
8. Explain the relation between s-plane and z-plane with the help of neat sketch; hence comment on stability of system.
9. What are the objectives of digital filters in DSP ?
10. Compare between IIR and FTR filters. **(10×4= 40 Marks)**

P.T.O.

PART – B

Module – I

11. a) What will be the problems associated with reconstruction of signals after sampling ? How these problems can be avoided ? 4

b) Define causality and linearity of a system and check for causality and linearity for $y(n) = x(n) - x(n^2 - n)$. 6

c) Test for energy and power of following sequence

i) $x(n) = e^{j\left(\frac{\pi}{2}n+\frac{\pi}{8}\right)}$

ii) $x(n) = \text{Cos}\,\frac{\pi}{6}n$. 6

d) Given $x_1(n) = \left\{\underset{\uparrow}{1,3,2,1}\right\}$ $x_2(n) = \left\{\underset{\uparrow}{1,-2,3,2}\right\}$ find following and sketch the result

i) x(2n)

ii) $[x_1(n)] \times [x_2(n)]$. 4

12. a) Perform convolution sum of two sequences using graphical method and hence verify the result using tabulation method

$x(n) = \left\{\underset{\uparrow}{1,2,2,1}\right\}$ h $(n) = \left\{1, \underset{\uparrow}{2}, 2, 2, 1\right\}$. 10

b) State and explain any two properties of DTFT. 4

c) Find DTFT of sequence $x(n) = a^n u(n)$. Where 'a' is a real and $|a|<1$ and hence plot the spectrum. 6

Module – II

13. a) State and explain scaling property of z-Transform and using this property find z-Transform of $x(n) = 2^n u(n)$. 5

b) Find z-Transform of following including ROC.

i) $x(n) = \frac{1}{2}\delta(n) + \delta(n-1) - \frac{1}{3}\delta(n-3)$

ii) $x(n) = a^n \sin(\omega_o n)u(n)$. 8

c) Obtain inverse z-Transform of $X(z) = \frac{Z}{3z^2 - 4z + 1}$ if ROCs are

i) $|z|>|$

ii) $|z| < \frac{1}{3}$

iii) $\frac{1}{3} <| z |<|$ 7

14. a) Check the stability of system described by system function

$H(z) = \frac{1}{1 - \frac{9}{2}z^{-1} - \frac{3}{2}z^{-2}}$ also explain the principle of Schur-Cohn stability test. 10

b) Given $x(n) = \{1, 2, 3, 4, 4, 3, 2, 1\}$, find DFT using Radix 2 FFT. 10

Module – III

15. a) Obtain direct form I and direct form II realization of the system function.

$H(z) = \frac{1 + 2z^{-1} + z^{-2}}{1 - 0.75z^{-1} + 0.125z^{-2}}$ 10

b) Obtain cascade and parallel form realization of $H(z) = \frac{3(2z^2 + 5z + 4)}{(2z + 1)(z + 2)}$. 10

16. a) Obtain the ladder structure of the given system function

$$H(z) = \frac{2 + 8z^{-1} + 6z^{-2}}{1 + 8z^{-1} + 12z^{-2}}.$$ 8

b) Design low pass Butterworth filter using bilinear transformation method for satisfying following constraints.

Pass band $w_p = 0.162$ rad

Stop band $w_s = 1.63$ rad

Pass band ripple = 3dB

Stop band attenuation = 30 dB

Sampling frequency = 8 KHz. 12