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A – 3836

Reg. No. :

Name :

Seventh Semester B.Tech. Degree Examination, June 2016
(2008 Scheme)
08.703 : DIGITAL SIGNAL PROCESSING (E)

Time : 3 Hours

Max. Marks : 100

PART – A



Answer **all** questions from Part A.

1. List and explain four elementary test signals.
2. Check whether the following system described by $y(n) = x(n) + nx(n - 1)$ is time variant or time invariant.
3. Draw the power spectrum for the signal, $x(t) = 4 + 2 \cos 3t + 3 \sin 4t$.
4. Find the DTFT for $x(n) = a^{|n|}$.
5. Find $x(\alpha)$, when $X(z) = \frac{z+1}{3(z-1)(z+0.9)}$. Use final value theorem.
6. Explain the relationship between z-transform and DTFT.
7. If $x_1(n) = (1, 1, 1)$ and $x_2(n) = (1, -2, 2)$, compute $x_1(n) \otimes x_2(n)$.
8. Prove that twiddle factor W_N obeys periodicity property.
9. Compare FIR and IIR filters.
10. Realise the system function with minimum number of multipliers

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

(10×4 = 40 Marks)



PART – B

Answer **one full** question from **each** Module.

Module – I

11. a) For the system described by $y(n) = x(-n)$, check the following properties 10
- 1) causality
 - 2) linearity
 - 3) static/dynamic
 - 4) time invariance
- b) Prove that $[x(n) * h_1(n)] * h_2(n) = x(n) * [h_1(n) * h_2(n)]$. 10
12. a) Determine the following LTI systems described by 10
- 1) $h(n) = 2^n u(n - 1)$
 - 2) $h(n) = 0.5^n u(n)$ are stable or not.
- b) Explain the phenomenon of aliasing in sampling and how it can be avoided. 10

Module – II

13. a) State and explain Schur - Cohn stability test. 8
- b) Use Schur-Cohn stability test to determine the following systems are stable or not
- 1) $H(z) = \frac{1}{z^2 - 0.4z + 0.04}$
 - 2) $H(z) = \frac{1}{1 - 1.75z^{-1} - 0.5z^{-2}}$. 12
14. a) Determine the 8 point DFT of the sequence, $x(n) = \{1, 1, 1, 1, 0, 0, 0, 0\}$. Use DIT – FFT algorithm. 10
- b) For $X(z) = \frac{z}{(z - 2)(z - 3)}$, find $x(n)$ if
- a) ROC : $|z| < 2$
 - b) ROC : $|z| > 3$
 - c) ROC : $2 < |z| < 3$. 10



Module - III

15. a) Draw the lattice structure and Direct form for $H(z) = 1 + 2z^{-1} + \frac{1}{3}z^{-2}$. 10

b) Draw the Direct form - II and its transposed realisation for

$$H(z) = \frac{2z^{-2}}{1 - \frac{1}{8}z^{-2} - 0.5z^{-3}}$$



16. a) For the analog transfer function $H(s) = \frac{2}{(s+1)(s+2)}$, determine $H(z)$ using impulse invariance method. Assume, $T = 1$ sec. 10

b) Explain any two method of designing IIR filters from analog filters. 10
