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A - 3836

Reg. No.:....

Name:

Seventh Semester B.Tech. Degree Examination, June 2016 (2008 Scheme)

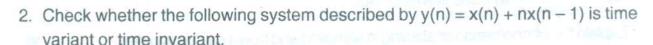
08.703 : DIGITAL SIGNAL PROCESSING (E)

Time: 3 Hours

PART-A

Answer all questions from Part A.

1. List and explain four elementary test signals.



- 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

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.
 - Explain the phenomenon of aliasing in sampling and how it can be avoided.

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Module - II

a) State and explain Schur - Cohn stability test.

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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)
$$H(z) = \frac{1}{1 - 1.75z^{-1} - 0.5z^{-2}}$$
.

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- 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.

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