Reg. No. : | | | | | | | | | | |

Question Paper Code: 55041

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2017

Fifth Semester

Electronics and Communication Engineering

15UEC501 - DIGITAL SIGNAL PROCESSING

(Regulation 2015)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

PART A - (5 x 1 = 5 Marks)

1. The DTFT of u(n) is

   (a) $\frac{e^{j\omega}}{1-e^{-j\omega}}$ (b) $\frac{e^{-j\omega}}{1-e^{-j\omega}}$ (c) $\frac{1}{1-e^{j\omega}}$ (d) $\frac{1}{1-e^{-j\omega}}$

2. Width of the main lobe of a Hanning window is

   (a) $\frac{4\,\pi}{M}$ (b) $\frac{8\,\pi}{M}$ (c) $\frac{12\,\pi}{M}$ (d) $\frac{16\,\pi}{M}$

3. The analog frequency transformation formula for Low pass to Low pass is

   (a) $s \rightarrow \frac{\Omega_c^*}{\Omega_c}.s$ (b) $s \rightarrow \frac{\Omega^*\Omega_c}{s}$ (c) $s \rightarrow \frac{s}{\Omega_c^*}$ (d) $s \rightarrow \frac{\Omega_c}{\Omega_c^*}.s$

4. The amplitude of zero input limit cycles are

   (a) Low (b) High
   (c) Neither low nor high (d) Both (a) and (b)

5. The number of registers in TMS 320 C5X processor is

   (a) 32 (b) 8 (c) 96 (d) 16

PART - B (5 x 3 = 15 Marks)

6. State the computational requirements of FFT and DFT.

7. What is Bi-linear transformation?

8. Explain Gibbs's phenomenon.

9. What is the dead-band of the filter?

10. What are the addressing modes of TMS 320 C5X?

PART - C (5 x 16 = 80 Marks)

11. (a) Given $x(n) = 2^n$ and N = 8. Find X(k) using DIT FFT algorithm. (16)

Or

(b) State and prove any four properties of DFT. (16)

12. (a) Determine H(z) for a Butter-worth filter satisfying the following constraints.

$$\sqrt{0.5} \leq \begin{cases} \left|H(e^{j\omega})\right| \leq 1; 0 \leq \omega \leq \dfrac{\pi}{2} \\ \left|H(e^{j\omega})\right| \leq 0.2; \dfrac{3\pi}{4} \leq \omega \leq \pi \end{cases}$$

With T = 1 sec. Apply impulse invariant transformation. (16)

Or

(b) Realize the following filter in Direct form – II

$H(z) = \frac{0.44z^{-1} + 0.36\,z^{-2} + 0.02\,z^{-3}}{1 + 0.4z^{-1} + 0.18z^{-2} - 0.2z^{-3}}$. (16)

13. (a) Design a filter with

$$H_d(e^{j\omega}) = \begin{cases} e^{j3\omega; -\frac{\pi}{4} \leq \omega \leq \frac{\pi}{4}} \\ 0; \dfrac{\pi}{4} \leq \omega \leq \pi \end{cases}$$

using a Hamming window with M = 7. (16)

Or

(b) (i) Obtain FIR linear phase realizations of the given system function.

$H(z) = \left[1 + \frac{1}{2}z^{-1} + z^{-2}\right][1 + \frac{1}{4}z^{-1} + z^{-2}]$. (8)

(ii) Obtain FIR linear phase realizations of the given system function.

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

14. (a) (i) Explain in detail about truncation error and round off errors. (8)

(ii) Explain the quantization effect in analog to digital conversion signal. (8)

Or

(b) A cascaded realization of two first order digital filters are given by the system functions of individual sections as

$$H_1(z) = \frac{1}{1 - 0.9z^{-1}};\ H_2(z) = \frac{1}{1 - 0.8z^{-1}}$$

Determine the overall output noise power. (16)

15. (a) Explain in detail the architecture of TMS 320 C5X. (16)

Or

(b) Explain in detail the overview of TMS 320 C67XX. (16)

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