**Printed Pages: 4** **EEC-602**

| (Following Paper ID and Roll No. to be filled in your Answer Books) | |
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| **Paper ID : 131602** | **Roll No.** |

**B.TECH.**

**Theory Examination (Semester-VI) 2015-16**

**DIGITAL SIGNAL PROCESSING**

***Time : 3 Hours*** ***Max. Marks : 100***

**Section-A**

**Q1. Attempt all question.** **(2×10=20)**

(a) Define DSP and its applications.

(b) Define computational efficiency of FFT.

(c) What are Gibbs Oscillations?

(d) What substitution is made in place of s in case of bilinear transformation?

(e) Write the time reversal and circular frequency shift property of DFT.

(f) Write the relationship between DFT and Z transform.

(g) Write five differences between Analog and Digital filters.

(h) Write five differences between IIR and FIR filters.

(i) Find the linear convolution of $S_1$ (n) = (1, 2, 3, 4) and $S_2$ (n) = (2, 3, 2, 1)

(j) What is linear phase FIR Filter?

**Section-B**

**Q2. Attempt any five questions. (10×5=50)**

(a) Determine H(z) using the impulse invariant technique for the analog system function :

$$H(s) = \frac{1}{(s+0.5)(s^2+0.5s+2)}$$

(b) Define DSP. Draw the block diagram of DSP and explain its components.

(c) Calculate the product of the DFT's of the two sequences $s_1(n)$ and $s_2(n)$, where $s_1(n)$ = { 1,1,1,1 } and $s_2(n)$={ 1,2,1,2 }

(d) Realise an FIR filter whose impulse response is h(n) = { 2,5,6,3,6,5,2 }

(e) Drive and draw the butterfly diagram for DIFFFT for N = 8

(f) Given the system function $H(z) = \frac{2 + 8z^{-1} + 6z^{-2}}{1 + 8z^{-1} + 12z^{-2}}$ .

Realise it using ladder structure.

## Section-C

**Attempt any two questions.** **(15×2=30)**

**Q3.** Given x(n) =$2^n$ and N=8 find X(K) using DIT FFT algorithm. Also calculate the computational reduction factor. Explain frequency transformation with LPF to HPF conversion formula.

**Q4.** (i) Determine the response of a discrete-time system to input signal s(n)={2, 1, 3, 1}, if the unit-sample response is of the system is h(n)={1, 2, 2, -1}

(ii) The desired response of a low-pass filter is

$$H_d(e^{jw}) = \begin{cases} e^{-j3w,} & \frac{-3\pi}{4} \le \omega \le \frac{3\pi}{4} \\ 0, & \frac{3\pi}{4} < |\omega| < \pi \end{cases}$$

Determine H($e^{jw}$) for M=7 using a hamming window.

**Q5.** Design a digital chebyshev filter to satisfy the constraints :

$0.707 \leq \left|H(e^{j\omega})\right| \leq 1 \qquad 0 \leq \omega \leq 0.2\pi$ Using bilinear transformation with T=1s

$\left|H(e^{j\omega})\right| \leq 0.1, \quad 0.5\pi \leq \omega \leq \pi$