

To be used next time
11/11
12/07

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B.TECH. (PART-TIME) DEGREE EXAMINATION, APRIL / MAY 2007.

INFORMATION TECHNOLOGY

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FOURTH SEMESTER

PTIF 237 - DIGITAL SIGNAL PROCESSING

TIME: THREE HOURS

MAXIMUM : 100 MARKS

ANSWER ALL THE QUESTIONS.
PART A — (10 X 2 = 20 MARKS)

1. Define energy and power signal.
2. What is BIBO stability condition?
3. State the number of complex multiplication and complex addition involve in N-point decimation-in-time FFT algorithms.
4. Why FIR filters are stable?
5. What is floating point representation?
6. State the effect of quantization in system design?
7. How the type of the filter (FIR / IIR) is decided?
8. State the formula for Bilinear transformation.
9. With examples explain the need for multi-rate digital signal processing?
10. Define down sampling process.

PART B - (5X16 = 80 marks)

11. Determine the 8-point DFT of the signal

$$x(n) = \{1, 1, 1, 1, 1, 1, 0, 0\}$$

Use decimation-in-time FFT algorithm.

12a. Design an FIR digital low pass filter with desired system function

$$H_d(w) = e^{-j3w}, \quad 0 \leq |w| \leq \pi/4$$
$$= 0, \quad \pi/4 \leq |w| \leq \pi.$$

Use Hamming window with $N=7$.

Or

- b.i. Explain why a rectangular window is not suitable in the design of FIR filter. Derive suitable equations for this.
- ii. State and explain the frequency sampling method of FIR filter design.

13a. Design an IIR digital low pass filter to meet the following requirements

Ripples in passband ≤ 1 dB, Passband cutoff freq. = 5 KHz
Ripples in stopband ≥ 50 dB, Stopband cutoff freq. = 8 KHz
Sample rate = 25 KHz.
Use bilinear transformation.

Or

- b.i. Explain the characteristics of a Butterworth filter. Compare Butterworth filter with Chebyshev filter.
- ii. Explain the design procedure for IIR filter.

14a. Realize the system with difference equation

$$y(n) = 0.5y(n-1) - 0.25y(n-2) + x(n) + 0.33x(n-1)$$

in (i) Direct form-I and II, and (ii) parallel form.

Or

- b. State four realization method of IIR filters and explain each with necessary block diagrams and equations .

15a. State and explain the sub band coding of speech signal.

Or

- b. Explain the following musical sound processing effects.
 - (i) Natural sounding reverberator
 - (ii) Flanging
 - (iii) Phasing
 - (iv) Chorus