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Question Paper Code : 41296

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2018

Sixth Semester

Information Technology

IT 6502 – DIGITAL SIGNAL PROCESSING

(Common to Computer Science and Engineering/Mechatronics Engineering)

(Regulations 2013)

Time : Three Hours

Maximum : 100 Marks

Answer ALL questions

PART – A

(10×2=20 Marks)

1. Define ROC.
2. Find the convolution of $x(n) = \{1, 2, 3, 1, 2, 1, 1\}$ and $h(n) = \{1, 2, 1\}$.
3. Is DFT of a finite duration sequence is periodic? If so, state the theorem.
4. Why FFT is needed?
5. What is warping effect?
6. Mention the methods for converting analog into digital IIR filter.
7. Compare Hanning and Hamming window.
8. What is Linear phase FIR filter?
9. Mention the types of quantization errors.
10. What is zero input limit cycle oscillations?

PART – B

(5×13=65 Marks)

11. a) i) Find the Z transform and ROC of
 - a) $x(n) = \delta(n)$
 - b) $x(n) = [3(3)^n - 4(2)^n] u(n)$**(6)**
- ii) Check whether the system $y(n) = nx^2(n)$ is static or dynamic, linear or non-linear, time variant or invariant, causal or non-causal. **(7)**

(OR)



- b) Determine the response of the system described by the difference equation
 $y(n) = 0.7 y(n - 1) - 0.12 y(n - 2) + x(n - 1) + x(n - 2)$ to the input
 $x(n) = \text{nu}(n)$. (13)

12. a) Starting from the key equation of DFT, with necessary equations explain
 DIT - FFT algorithm. (13)

(OR)

- b) Find the 8 point DFT of $x(n) = \{0, 1, 2, 3, 4, 5, 6, 7\}$ using DIF-FFT
 algorithm. (13)

13. a) Convert the analog filter with transfer function $H(s) = \frac{2}{(s+1)(s+2)}$ into digital
 filter using impulse invariant method. (13)

(OR)

- b) Design a digital filter which exhibits equiripple behaviour only either in pass
 band or stop band and monotonic characteristics either in pass band or stop
 band and satisfying the constraints.

$$0.8 \leq |H(e^{j\omega})| \leq 1 \quad \text{for } 0 \leq \omega \leq 0.2 \pi$$

$$|H(e^{j\omega})| \leq 0.2 \quad \text{for } 0.6 \pi \leq \omega \leq \pi$$

using Bilinear transformation. (13)

14. a) Explain the procedure of designing FIR filters by windows. (13)

(OR)

- b) Explain frequency sampling method of designing FIR filters. (13)

15. a) Explain the various quantization errors in detail. (13)

(OR)

- b) Explain limit cycle oscillations in detail. (13)

PART - C

(1×15=15 Marks)

16. a) Find the 8 point DFT of $x(n) = \{1, 2, 3, 4, 4, 3, 2, 1\}$ using DIT-FFT
 algorithm. (15)

(OR)

- b) Explain the characteristics of limit cycle oscillation represented to the system
 described by $y(n) = 0.95 y(n - 1) + x(n)$. Determine the dead band of the filter. (15)