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**Question Paper Code : 42396**

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2018
Sixth/Seventh Semester
Computer Science and Engineering
CS 2403 – DIGITAL SIGNAL PROCESSING
(Common to Information Technology)
(Regulations 2008)
(Also common to PTCS 2403 – Digital Signal Processing for B.E. (Part-Time) Fifth Semester – CSE – Regulations 2009)

Time : Three Hours | Maximum : 100 Marks

Answer ALL questions

PART – A **(10×2=20 Marks)**

1. Write the condition to be satisfied for a discrete time signal to be periodic.
2. A sequence is defined by $x(n) = \begin{cases} 4(-1)^n & n \geq 0 \\ 0 & \text{otherwise} \end{cases}$. Find out the power of x(n).
3. State Parseval's theorem.
4. Why is FFT needed ?
5. Highlight the benefits of bi-linear transformation method.
6. What is warping effect ?
7. Windowing technique is basically used in the design of digital filter. Why ?
8. State the necessary and sufficient conditions for the FIR filter to have linear phase.
9. Differentiate between decimation and interpolation.
10. Why are FIR filters mostly used in the design of adaptive filter ?

PART – B (5×16=80 Marks)

11. a) i) Determine whether the system described by the input-output equation. $y(n) = ax(n) + b$ is linear, time in-variant. (8)

ii) Obtain the z-transform and ROC of the signal $x(n) = \left(\frac{1}{4}\right)^n u(n)$. (8)

(OR)

b) i) What is meant by the correlation of two sequences ? Classify its types and describe each of them. (8)

ii) Find the convolution of two finite duration sequences.

$h(n) = a^n u(n)$ for all n

$x(n) = b^n u(n)$ for all n

for $a \neq b$ and $a = b$. (8)

12. a) i) Compute the N point DFT of the finite length sequence given as $u(n) = e^{-n}$, $0 \leq n \leq 4$. (10)

ii) Compare the number of computation in direct DFT and FFT in terms of number of complex additions and multiplications for the value of N as 4, 8 and 16. (6)

(OR)

b) An 8 point sequence is given by $x(n) = \{2, 2, 2, 2, 1, 1, 1, 1\}$. Compute 8 point DFT of x(n) by radix – 2 DITFFT. (16)

13. a) Find the direct form I realization of a discrete time system represented by the transfer function $H(z) = \frac{8z^3 - 4z^2 + 11z - 2}{\left(z - \frac{1}{4}\right)\left(z^2 - z + \frac{1}{2}\right)}$. (16)

(OR)

b) Using impulse variance method with T = 1 sec, determine H(z) if $H(s) = \frac{1}{s^2 + \sqrt{2}s + 1}$. (16)

14. a) Obtain cascade form realization of the system function

$$H(z) = \left[1 + \frac{1}{4}z^{-1} + \frac{z^{-2}}{2}\right]\left[1 + \frac{1}{8}z^{-1} + \frac{z^{-2}}{2}\right].$$ **(16)**

(OR)

b) Design a FIR filter to meet the following specifications :

fp = 2 KHz, fs = 4 KHz, Ap = 2 dB

As = 40 dB, sampling frequency = 20 KHz. **(16)**

15. a) With a neat block diagram explain

i) Basic image restoration process.

ii) Image compression techniques. **(16)**

(OR)

b) Discuss the process of adaptive noise cancellation with required sketches. **(16)**

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