Registration No: - | | | | | | | | | | |

Total Number of Pages:02 **B.Tech**
PCS6J002

(6th) Semester Regular / Back Examination: 2018-19
DIGITAL SIGNAL PROCESSING
Branch: CSE
Max Marks: 100
Time: 3 Hours
Q Code:F623

Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.
The figures in the right hand margin indicate marks.

Part- I

Q1 Only Short Answer Type Questions (Answer All-10)

Suggested Words: How, Why, Determine, Derive, State, Write, Create, etc

a) Find the Nyquist rate for the signal given below . $x(n) = 1000\,(\cos 2\pi 500t + sin100t)$ **(2)**

b) What is particular solution of impulse response? **(2)**

c) Express any arbitrary signal as summation of unit impulse signal. **(2)**

d) State the stability and causality condition of an LTI system using Z-transform? **(2)**

e) Calculate the step response of the system if the impulse response is $h(n)=\delta(n)+\delta(n-1)$. **(2)**

f) What is twiddle factor write two of its properties? **(2)**

g) To compute 16 point DFT using radix-2 DIT FFT algorithm how many complex multiplications and additions are required? **(2)**

h) Why linear phase plays an important role? Justify the statement with example. **(2)**

i) Why transition band is developed in the practical filter? **(2)**

j) State the conjugate property of Z-transform. **(2)**

Part- II

Q2 Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)

Analyze, Justify, Design, Formulate, Calculate, Develop, Illustrate, Explain, Distinguish, Differences & Similarities

a) Find the Energy and Power of the Signals **(6)**

(i)$x1(n) = \left(\frac{1}{3}\right)^n u(n)$

(ii) $x2(n) = \left(\frac{\pi}{4}\right) n$

b) Compute the auto co-relation of a signal $x(n) = a^n u(n), 0 < a < 1$ (without using z-transform) **(6)**

c) Proof multiplication by n or differentiation in Z-domain property of Z-transform. **(6)**

d) Calculate the Z-transform of $x(n) = \begin{cases} \left(\frac{1}{3}\right)^n, n \geq 0 \\ \left(\frac{1}{2}\right)^n, n < 0 \end{cases}$ **(6)**

e) Compute the 4 point DFT of $x(n)=(-1)^n$. **(6)**

f) Demonstrate DFT as Linear transform. **(6)**

g) Describe 4 point DIT radix-2 FFT with butterfly diagram. **(6)**

h) Explain filtering of long data sequence using overlap save method with neat diagram. **(6)**

i) Compute the frequency response of the rectangular window. **(6)**

j) Derive the condition for linear phase FIR. **(6)**

k) Write the advantage and disadvantages of impulse invariant method. **(6)**

l) Obtain the canonical representation of the given FIR filter **(6)**

$H(z)=-0.0624+0.0935z^{-1}+0.3027z^{-2}+0.4z^{-3}+0.3027z^{-4}+0.0935z^{-5}-0.0624z^{-6}$

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

Discuss, Describe, Examine, Classify, Prove, Evaluate, Compare, Contrast, etc

Q3 Calculate the Circular convolution between the two sequence using DFT IDFT methods. **(16)**

$x1(n)=\{2,1,2,1\}, x2(n)=\{1,2,3,4\}$

Q4 Compute the Convolution of the following signals by means of Z-transform **(16)**

$$x1(n)=\begin{cases}\left(\frac{1}{3}\right)^n, n\geq 0\\ \left(\frac{1}{2}\right)^{-n}, n<o\end{cases}$$ and

Q5 Compute the 8 point DFT of the sequence $x(n)=\{1,1,1,1,1,1,1,1\}$ using radix-2 DIT FFT algorithm. **(16)**

Q6 Compute the step response and impulse response of the system $y(n)=0.6y(n-1)-0.08y(n-2)+x(n)$ **(16)**