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

Total Number of Pages : 02 **B.Tech.**
PCEC4304

6th Semester Back Examination 2017-18
DIGITAL SIGNAL PROCESSING
BRANCH : AEIE, CSE, ECE, EEE, EIE, ETC, IEE, MECH
Time : 3 Hours
Max Marks : 70
Q.CODE : C334
Answer Question No.1 which is compulsory and any five from the rest.
The figures in the right hand margin indicate marks.

Q1 **Answer the following questions :** **(2 x 10)**

a) Write the major applications of DSP telemetry.

b) Determine the values of power and energy signal of $x(n)=\left(\frac{1}{3}\right)^n u(n)$.

c) Represent the sequence $x(n)=\{4,2,-1,1,3,2,1,5\}$ as sum of shifted unit impulses.

d) State the difference between DIT and DIF filter.

e) Find the Z-transform of the signal $x(n)=\sin(n\theta)u(n)$.

f) What is zero padding? What are it's used?

g) What is twiddle factor? What are its properties?

h) How many multiplications and additions are required to compute 32-point DFT using radix-2 FFT?

i) What is wrapping?

j) How one can design digital filters from analog filters?

Q2 **a)** Show that the following systems are nonlinear and time invariant. **(5)**
y(n) – x(n)y(n-1) = x(n)

b) Using Residue Method, find inverse Z-transform of $X(Z)=\frac{1-\frac{1}{4}Z^{-1}}{1-\frac{1}{4}Z^{-2}}$, **(5)**

ROC: $Z \rangle \frac{1}{3}$.

Q3 **a)** Find the natural response of the system described by difference equation $y(n)+2y(n-1)+y(n-2)=x(n)+x(n-1)$ with initial conditions $y(-1)=y(-2)=1$. **(6)**

b) Distinguish between recursive realization and non-recursive realization. **(4)**

Q4 **a)** Find the DFT of a sequence x(n) ={1 ,1, 3,4,4,3,2,1} **(5)**

b) Find the Z-transform of x(n)= $(1/8)^n$ u(n) and its ROC. **(5)**

Q5 **a)** Obtain the direct form I, direct form II and Cascade form realization of the following system functions. **(6)**

Y(n) = 0.1 y(n-1) + 0.2 y(n-2) + 3x(n) + 3.6 x(n-1) + 0.6 x(n-2).

b) Using impulse invariance method, with T=1sec determine H(z) if **(4)**

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

Q6 **(a)** The linear convolution of a length 50 sequence with the length of 500 sequences is to be computed using 64-point DFTs and IDFTs. **(5)**

i) What is the smallest numbers of DFTs and IDFTs needed to compute the linear convolution using over-lap add method?

ii) What is the smallest numbers of DFTs and IDFTs needed to compute the linear convolution using over-lap save method?

(b) The system function of the analog filter is given as $H_a(s)=\frac{(S+0.1)}{\left((S+0.1)^2+9\right)}$. **(5)**

Obtain the system function of the IIR digital filter by using Impulse Invariance Method.

Q7 Perform the circular convolution of the following sequences $x(n)=\{1,1,2,1\}$ *and* $h(n)=\{1,2,3,4\}$ using DFT and IDFT Method. **(10)**

Q8 **Write short answer on any TWO :** **(5 x 2)**

a) Section Convolution

b) DIF FFT

c) ROC of Z-transform

d) DCT is an orthogonal transform