Total No. of Questions : 8]

SEAT No. : ____

P315

[Total No. of Pages : 2

[6003]-395
T.E. (E & TC)
DIGITAL SIGNAL PROCESSING
(2019 Pattern) (Semester - I) (Elective - I) (304185(A))

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Your answers will be valued as a whole.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

Q1) a) Compute the 5-point DFT for the given sequence $x[n]=\{1,0,1,0,1\}$. **[6]**

b) State and prove any two important properties of DFT. **[6]**

c) Compare DFT and FFT on the basis of computational complexity for N = 64, 256 & 1024. **[6]**

OR

Q2) a) Determine the sequence $y(n)=x(n)\textcircled{N}\,h(n)$ where $x(n)=\{1,2,3,1\}$ and $h(n)=\{4,3,2,2\}$. **[8]**

b) Find the 8 point DFT of sequence $x(n)=\{1,2,3,4,4,3,2,1\}$ using decimation in time radix-2 FFT algorithm. **[10]**

Q3) a) List out the advantages and disadvantages of digital filters. **[7]**

b) Find out H(z) using impulse invariance method at 5 Hg sampling frequency from H(s) as given $H(s)=\dfrac{2}{(s+1)(s+2)}$. **[10]**

OR

P.T.O.

Q4) a) Compare impulse invariance and bilinear transformation methods. **[7]**

b) The system transfer function of analog filter is given by $H(s) = \frac{s+0.1}{(s+0.1)^2+16}$. Obtain the system transfer function of digital filter using bilinear transformation which is resonant at $W_r = \frac{\pi}{2}$. **[10]**

Q5) a) List out the advantages and disadvantage of FIR filters. **[6]**

b) Explain the Gibb's phenomenon. **[6]**

c) Design a linear phase FIR low pass filter of length seven with cut-off frequency 1 rad/sec using rectangular window. **[6]**

OR

Q6) a) Find the magnitude and phase response function of seventh order low pass linear phase FIR filter with cut-off frequency 1rad/sec using Hanning window. **[8]**

b) Design an FIR filter with Hamming window for following specification **[10]**

$$H_d(w) = e^{-j3w} \quad -\frac{\pi}{4} \le w \le \frac{\pi}{4}$$

$$= 0 \qquad \frac{\pi}{4} < w \le \pi$$

Q7) a) Write short notes on: **[4×2.5=10]**

i) Identification of voiced and unvoiced sound

ii) LTI representation of speech signal

iii) Basics of ECG signal

iv) Power line interference

b) Describe the ECG signal with the help of neat sketch and elaborate types of interference. **[7]**

OR

Q8) a) List out the R-peak detection methods and explain in detail any one of the promenent technique. **[9]**

b) Write short notes on: **[8]**

i) Spatial and temporal resolution

ii) 2D convolution for feature extraction