PVP 14

Code: EC5T6

III B.Tech - I Semester – Regular/Supplementary Examinations
March - 2021

DIGITAL SIGNAL PROCESSING
(ELECTRONICS & COMMUNICATION ENGINEERING)

Duration: 3 hours Max. Marks: 70

PART – A

Answer ***all*** the questions. All questions carry equal marks

11x 2 = 22 M

1.

a) Compute the convolution of the following signals x(n) = {1,2,4}, and h(n) = {1,1,1,1,1}.
b) What is the Z-transform of the sequence $a^n x(n)$ if the Z-transform of x(n) is X(Z)?
c) State the time shifting property of DFT.
d) Give the computational efficiency of FFT over DFT.
e) Define IIR filter.
f) What is the difference between digital filter and analog filter?
g) What are the advantages of FIR filters compared to IIR filters.
h) Compare Direct form-I and Direct form-II realizations.
i) Obtain down sampled signal by the factor 2 of the following sequence x(n)= {..., 4, 1, 5, 9, 6, 3, 8, …}.

j) Write two applications of multirate digital signal processing?

k) Define ROC of Z-transform

PART – B

Answer any ***THREE*** questions. All questions carry equal marks.

3 x 16 = 48 M

2. a) Determine whether the following systems are i) linear or nonlinear, ii) causal or noncausal, iii) stable or unstable iv) time invariant or time varying.

(I) y(n) = x(-n+2)

(II) y(n) = x(2n) 8 M

b) Determine the impulse response h(n) for the system described by the second order difference equation:

$$y(n) - 3y(n-1) - 4y(n-2) = x(n) + 2x(n-1)$$

8 M

3. a) Determine the DFT of the 4-point sequence

x(n) = {0, 1, 2, 3} 8 M

b) Find the circular convolution of the two sequences

$x_1(n)$ = {2, 1, 2, 1} and $x_2(n)$ ={1, 2, 3, 4} 8 M

4. The specifications of the desired low pass filter are given below. Design a Butterworth digital filter using bilinear

transformation with T= 1sec.

$0.9 \leq |H(\omega)| \leq 1 \quad for \quad 0 \leq |\omega| \leq \frac{\pi}{2}$

$|H(\omega)| \leq 0.1 \quad for \quad \frac{3\pi}{4} \leq |\omega| \leq \pi$

16 M

5. a) Obtain the Direct form realization of

$$H(z) = \frac{1}{2} + \frac{1}{3}z^{-1} + z^{-2} + \frac{1}{4}z^{-3} + z^{-4} + \frac{1}{3}z^{-5} + \frac{1}{2}z^{-6}$$

8 M

b) Determine the expression for the frequency response of symmetric FIR filter when N is odd. 8 M

6. a) Determine the spectrum of down sampled signal and explain. 8 M

b) Explain implementation of sampling rate conversion by a rational factor L/M . 8 M