PVP 14

Code: EC5T6

III B.Tech - I Semester – Regular/Supplementary Examinations
October 2018

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) Determine whether the signal x(n) = u(n) is energy signal or not.
   b) If the number of samples in the sequence x(n) is 12 and the number of samples in the sequence h(n) is 6, then what is the number of samples in the sequence of convolution of x(n) and h(n).
   c) Find the Z transform of $a^n u(n)$.
   d) How many number of complex multiplication required in DFT and FFT with 8 point sequence?
   e) Find the 4 point DFT of the sequence x(n) = {1,0,0,0}
   f) Give any two techniques to design IIR filter from analog filter.
   g) What is wrapping effect?
   h) FIR filters are always stable –Justify.
   i) State any two properties of IIR filter.
   j) Compare linear convolution and circular convolution.
   k) What are the applications of multi-rate digital signal processing?

PART – B

Answer any ***THREE*** questions. All questions carry equal marks.
3 x 16 = 48 M

2. a) State and prove Parsval's theorem. 4 M

   b) Test whether the following signals are periodic or not. If periodic, find the fundamental time period. 12 M

   i) 5Sin(2n)

   ii) 25Cos(60πn)

   iii) 5Sin(2n) + 25Cos(25πn)

   iv) 5Sin(2πn) + 25Cos(25πn)

3. a) State and prove any four properties of DFT. 8 M

   b) Find 8 point DFT of the sequence x(n) = {1,2,3,4,4,3,2,1} using DIF algorithm. 8 M

4. a) Compare Butterworth and Chebyshev filters. 8 M

   b) Find the order and the poles of a low pass Butterworth filter that has -3 dB bandwidth of 300 Hz and an attenuation of 30 dB at 3000 Hz. 8 M

5. a) Compare IIR and FIR filters. 8 M

b) Design an FIR digital filter to approximate an ideal low pass filter with pass band gain of unity, cut-off frequency of 1.2 KHz. and working at a sampling frequency of 5 KHz. The length of the impulse response should be 10.

8 M

6. a) Explain interpolation and decimation and give their applications. 4 M

b) For the input sequence

$x(n) = \{5,9,5,6,5,13,10,5,9,5,6,5,13,0,0,0,6,5\}$,

i) find the output sequence $y_1(n)$ which is up sampled version of x(n) by 8.

ii) find the output sequence $y_2(n)$ which is down sampled version of x(n) by 4

iii) find the output sequence $y_3(n)$ which is up sampled version of x(n) by 8 and then down sampled by 4.

iv) draw the spectrum for x(n), $y_1(n)$, $y_2(n)$ and $y_3(n)$.

12 M