2019

MSc

2nd Semester Examination

ELECTRONICS

PAPER – ELC-201

Full Marks: 50

Time: 2 Hours

The figures in the right-hand margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

Illustrate the answers wherever necessary.

1. Answer any *04* questions out of *08* questions carrying *02* marks of each. (2×4)

i) What is aliasing effect?

ii) Explain the time shifting property of discrete time Fourier Transform (DTFT).

iii) What are the properties of frequency response $H(e^{j\omega})$ of Linear Time Invariant (LTI) system?

iv) What is causality condition for an LTI system?

v) What is the main advantage of direct – form II realization when compared to direct – form I realization for IIR systems?

vi) Find the even and odd part of $x[n] = 3e^{j\frac{\pi}{5}n}$

vi) If $x[n] = [-1,3,7,2,8,0, -3,5,2,1,3,2,6,3,8,3,]$ where $x[n]$ is a left hand signal, find $X[3n-2]$.

viii) What is half-wave symmetry? Give suitable example.

2. Answer any *04* questions out of *08* questions carrying *04* marks of each. 4×4=16

i) State the difference between overlap save method and overlap – add method for filtering the long duration sequences. 4

ii) Given the sequences $x_1(n) = \{1,2,3,4\}; x_2(n) = \{1,1,2,2\}$. Find $X_3(n)$ such that $X_3(k) = X_1(K)\, X_2(K)$. 4

iii) Test the stability of the system whose impulse response $h(n) = \left(\frac{1}{2}\right)^n u(n)$. 4

iv) Find the output y(n) of a filter whose impulse response is h(n)={1,1,1 } and input Signal x(n) = {3, -1,0,1,3,2,0,1,2,1} using overlap – add method. 4

v) Check whether the system given by y(n) = x (-n+2) is linear or not. 4

vi) Find the inverse Fourier transform of $x(j\omega) = \begin{cases} 1 & -W \le \omega \le W \\ 0 & |\omega| \ge 0 \end{cases}$ 4

vii) For the sequence $x(n) = \{1,1,0,0,-1,-1,0,0\}$, determine the 8 point DFT. 4

viii) Compute the circular convolution of the following two sequence $x_1(n) = \{2,1,2,1\}$ and $x_2(n) = \{1,2,3,4\}$ 4

3. Answer any *02* questions out of *04* questions carrying *08* marks of each.

i) (a) What is zero padding ? What are its uses?

(b) What is the input signal $x(n)$ that will generate the output sequence

$y(n)=\{1,5,10,11,8,4,1\}$ for a system with impulse response

$h(n)=\{1,2,1\}$

(2+1)+5

ii) (a) Verify Parseval's theorem for the signal

$$g(t)=e^{-a(t)}u(t),(a>0)$$

(b) Estimate the essential bandwidth ω(in rad/S) of the signal $e^{-at}u(t)$ if the essential band is required to obtain 95% of the signal energy.

iii) a) Why the concept of analog filter is essential to design digital filter?
b) What is up sampling?
c) Justify the statement 'all signals can be represented by shifted delta function'?
d) What is bit reversal? 2+2+2+2

iv) a) What is the significance of 'infinite' term in connection of IIR (Infinite Impulse Response) filter?
b) Why do we prefer to use 'Direct Form II' structure over 'Direct Form I''? Justify your answer with suitable IIR filter?
c) Draw a second order 'Transposed Direct Form I' IIR filter.
d) For simplicity higher order systems are decomposed into lower order systems (cascade and/or parallel form), more precisely into 'second order' system, but we do not prefer to use 'first order system whenever possible. Why ?
2+2+2+2

(Internal Assessment : 10 Marks)