B.TECH. SEM -VII ELECTRICAL 2014 COURSE (CBCS) :
SUMMER - 2018
SUBJECT: ELECTIVE – III: DIGITAL SIGNAL PROCESSING

Day: **Wednesday** **S-2018-2493** Time: **02.30 PM TO 05.30 PM**
Date: **23/05/2018** Max. Marks: 60

N.B.:

1) All questions are **COMPULSORY**.
2) Figures to the right indicate **FULL** marks.
3) Draw neat and labeled diagram **WHEREVER** necessary.
4) Use of non programmable **CALCULATOR** is allowed.
5) Assume suitable data if necessary.

Q.1 a) What is a discrete time system? Explain the following **[05]**
i) Linear or Non-Linear discrete time system.
ii) Causal or Non-causal discrete time system.

b) Determine if system is time – invariant or time – variant **[05]**
i) $y(n) = ax(n-1) + bx(n-2)$
ii) $y(n) = x(n) + nx(n+1)$
iii) $y(n) = x(n^2)$

OR

a) With a block diagram, explain the process of analog to digital conversion. **[05]**

b) Compute convolution $y(n) = x(n) * n(n)$ of the following **[05]**

$x(n) = \{1, 2, 3, 1\}$ $n(n) = \{1, 2, 1, -1\}$
$\uparrow$ $\uparrow$

Use graphical method.

Q.2 a) State and explain linearity and convolution property of fourier transform. **[05]**

b) Determine inverse z-transform of function $x(z) = \dfrac{[8z-19]}{[(z-2)(z-3)]}$. **[05]**

$x(n)$ is causal sequence

OR

a) State any four properties of z-transform. **[05]**

b) Determine the z-transform and define its ROC for $x(n) = \alpha^n u(n) + \beta^n(-n-1)$. **[05]**

Q.3 Define the significance of poles and zeros in LTI system. **[10]**

OR

What are the advantages of Digital filter over analog filter? **[10]**

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Q.4 **a)** State DFT and describe any four properties of the same. **[05]**

b) Compute DFT and 4-point sequence x(n) = {0, 1, 2, 3}. **[05]**

OR

a) Explain computational efficiencies of FFT over DFT. **[05]**

b) Find circular convolution of following sequences **[05]**

$x_1(n) = \{\underset{\uparrow}{2}, 1, 2, 1\}$ $\quad x_2(n) = \{\underset{\uparrow}{1}, 2, 3, 4\}$

Q.5 **a)** Compare impulse invariant method and bilinear transformation method of IIR filters. **[05]**

b) Using frequency sampling method, design low pas FIR filter to meet the following specifications: **[05]**

Passband 0 – 5 KHz
Sampling frequency 18 KHz
Filter length 9

OR

a) Compare Butterworth and Chebyshev approximations. **[05]**

b) The system transfer function of analog filter is given by, **[05]**

$$H(s) = \frac{s+0.1}{(s+0.1)^2+16}.$$

Q.6 **a)** Obtain direct form II and cascade realizations for the IIR filter system. **[05]**
y(n) = – 0.1 y(n – 1) + 0.2 y(n – 2) + 3x(n) + 3.6x(n – 1) + 0.6x(n – 2).

b) Explain cascade form realization of FIR filter. **[05]**

OR

a) Determine direct form – II realization for each of the following LTI system: **[05]**
i) 2y(n) + y(n – 1) – 4y (n – 3) = x(n) + 3x(n – 1).
ii) y(n) = x(n) – x(n – 1) + 2x(n – 2) – 3x (n – 4).

b) Draw cascade realization of $H(z) = 1 + \frac{3}{2} z^{-1} + \frac{3}{2} z^{-2} - z^{-3}$. **[05]**

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