



Reg. No. :

Name :

**Sixth Semester B.Tech. Degree Examination, May 2014
(2008 Scheme)**

**Branch : Computer Science and Engineering
08.604 : DIGITAL SIGNAL PROCESSING (R)**

Time : 3 Hours

Max. Marks : 100

PART – A

Answer **all** questions. **Each** question carries **4** marks.

1. Define and plot any two elementary discrete time signals.
2. What do you mean by impulse response ?
3. Define convolution. What is its significance in a LTI system ?
4. What do you mean by linearity ?
5. What is the relation between DTFT and DFT ?
6. If $X_1(z)$ is the Z-transform of $x_1[n]$ and $X_2(z)$ is the Z-transform of $x_2[n]$, then find the Z-transform of $x_3[n] = 3x_1[n] + 4x_2[n]$.
7. Find the 4-point circular convolution of the two sequences $x(n) = [1, 1, 1, 1]$ and $h(n) = [1, -1, 1]$.
8. Which of the following systems are FIR ? Justify your answer.
 $y[n] = 0.75y[n - 1] + 0.125y[n - 2] + x[n] + 0.66x[n - 1]$
 $y[n] = x[n] + 2x[n - 1] + 3x[n - 2] + 2x[n - 3] + x[n - 4]$
9. Explain the cascade form realization of IIR filters.
10. Find the difference equation of the following system.
 $H(z) = (1 + 2z^{-1} + 3z^{-2}) / (3z^{-1} - 3 + 2z - 4 + 1)$



(10×4=40 Marks)



PART – B

Answer **any one** question from **each** Module. **Each** question carries **20** marks.

Module – 1

11. a) A system's impulse response is given by $h(n) = 2u[n] - u[n - 2] - u[n - 3]$. Find the response $y(n)$ of the system if an input $x(n) = u(n) - (n - 1)u(n - 1)$ is given to the system. 12
- b) What is the relation between impulse response and unit step response of a system? Find the unit step response of a system with impulse response $h[n] = u[n] - u[n - 4]$. 8
12. A discrete time signal $x(n) = [1, 2, 3, 4, 3, 2, 1]$. Sketch and label each of the following signals :
- $x[2 - n]$
 - $-2x[n + 1]$
 - $x[-2n]$
 - $3x[n]u[n - 2]$
 - $x[n] \delta(n - 2) + x[n] \delta(n - 4)$. (5×4=20 Marks)

Module – 2

13. a) Find the inverse Z-transform of the following signal $X(z) = \frac{z}{(z^2 - 5z + 6)}$. 8
- b) Using Z-transform method find the impulse response of the system defined by the following difference equation.
- $$y[n] = x[n] + 3y[n - 1] - 2y[n - 2]$$
- 12
14. Compute 8-point DFT of the sequence $x(n) = \{1, 1, 2, 3\}$ by :
- DIT radix-2 FFT and
 - DIF radix-2 FFT

Module – 3

15. Realize the direct form – I and direct form – II structures of the IIR system represented by the transfer function $H(z) = \frac{8z^3 - 4z^2 + 11z - 2}{(z - 0.25)(z^2 - z + 0.5)}$.
16. Realize the following FIR systems with minimum number of multipliers.
- $H(z) = 0.5 + 0.3z^{-1} + 2z^{-1} + 3z^{-2} + 2z^{-1}$
 - $H(z) = (1 + z^{-1} + 2z^{-1})(1 + 2z^{-1} + 3z^{-2})$