

Reg. No.:....

Name: .....

Sixth Semester B.Tech. Degree Examination, March 2015 (2008 Scheme)

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

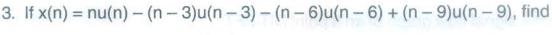
Time: 3 Hours

Max. Marks: 100

# PART-A

Answer all questions. Each question carries 4 marks.

- 1. Define and plot unit step and unit ramp signals.
- 2. What do you mean by time invariance?



a) 
$$y_1(n) = x(3n - 5) - x(2n)$$

b) 
$$y_2(n) = x(-3n-2)$$

- 4. Illustrate shifting operation by taking a unit step signal as an example.
- 5. What is the relation between Fourier Transform and Z-Transform?
- 6. Define DFT. State and prove the shifting property of DFT.
  - 7. Find the Z-Transform of a rectangular function.

$$x(n) = A$$
 if  $|n| \le N$ ;  
0 if  $|n| > N$ .

- 8. If X(z) is the Z-Transform of x[n], derive the Z-Transform of x[n-p].
- 9. Distinguish between IIR and FIR filters.
- 10. Explain the parallel form realization of IIR filters.





### PART-B

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

#### Module - 1

- 11. a) Explain the concept of convolution. What is its significance in LTI systems?
  - Find the convolution of the following pair of signals. Plot the input and output signals

$$x(n) = [1, 2, 3, 4]$$

$$h(n) = [1, 2, 1]$$

$$s[n] = [1, 2, 2, 1]$$

$$r(n) = [-1, 2, -1, 3]$$

(7×2=14 Marks)

- 12. a) Define linearity. What is its significance?
  - b) Check whether the following systems are linear, time invariant, causal and/or causal i) y(n) = nx[n] ii) y[n] = 3x[n] + 1.5x[n 1]. (8x2=16 Marks)

## Module - 2

13. a) Draw the signal flow graph of an 8 point DIT FFT.

2, 1].

4

8

12

6

- b) Consider a sequence x[n] defined for 0≤ n ≤ 7, x[n] = [1, 1, -1, 2, 2, -1, 2, 1].
  Evaluate 8 point-DFT of the sequence using FFT.
- 14. a) Find X(k) and H(k) if x[n] = [1, 2, 1, 2] and h[n] = [2, 1, 2]. Given that Y(k) = X(k).H(k), find y[n].
  - b) How is y[n] related to x[n]? How can we make y[n] numerically equal to the linear convolution of x[n] and h[n]?

## Module - 3

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

a) 
$$H(z) = 0.5 + 0.3z^{-1} + 2z^{-1} + 3z^{-2} + 2z^{-1}$$

b) 
$$H(z) = (1 + z^{-1} + 2z^{-1}) (1 + 2z^{-1} + 3z^{-2})$$