

Code: EC5T6

**III B.Tech - I Semester – Regular/Supplementary Examinations  
October 2017**

**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) Define discrete signal.
- b) Mention any two differences between digital signal processing over analog signal processing.
- c) What is meant by real and odd sequence?
- d) Mention any two applications of FFT algorithm.
- e) Write the Z-transform of a unit-impulse sequence.
- f) Mention any two advantages of Bilinear transformation.
- g) Write the relation between Z-transform and Laplace transform.
- h) Mention any two applications of multi-rate digital signal processing.
- i) Distinguish between IIR and FIR filters.
- j) Mention any two methods for design of FIR digital filters.
- k) What is the importance of window functions?

## PART – B

Answer any **THREE** questions. All questions carry equal marks.

3 x 16 = 48 M

2. a) i) Determine the system function and the unit sample response of the system described by the difference equation  $y(n) = 0.5 y(n - 1) + 2 x(n)$ . 4 M

ii) Determine whether  $x(n) = n x(n^2)$  is a Linear, time-invariant, casual, and stable system. 4 M

b) Determine the inverse Z-transform of

$$X(Z) = 1/(1 - 1.5Z^{-1} + 0.5 Z^{-2}) \text{ when}$$

i) ROC:  $|Z| > 1$       ii) ROC:  $|Z| < 0.5$  8 M

3.a) Compute the 8-point DFT of the sequence

$x(n) = \{ 1, 0, -1, 0, 1, 0, 1, 0 \}$  using the in place radix-2 decimation in-frequency. 8 M

b) State and prove the following properties with respect to the DFT: 8 M

i) Circular correlation

ii) Complex Conjugate

iii) Circular Time shift

iv) Multiplication of two sequences

- 4.a) Convert the analog filter with system function  
 $H(s) = (s + 0.1)/((s + 0.1)^2 + 16)$  into a digital IIR filter  
by means of the bilinear transformation. Given digital filter  
is to have a resonant frequency of  $\pi/2$ . 8 M
- b) Mention any four differences between Chebyshev and  
Butterworth filter design methods. 8 M
- 5.a) Realize the following filter using cascade form, Direct  
form-I for a LTI system whose transfer function is  
 $H(Z) = (1 - 3Z^{-1} + 2Z^{-2})/(1 + 0.3Z^{-1} - 0.1Z^{-2})$   
12 M
- b) Compare different realization techniques for FIR filters.  
4 M
- 6.a) Explain briefly about the decimation and Interpolation by  
integer factor. 10 M
- b) List the applications of multi rate signal processing. 6 M