

Roll No.

Total Pages : 3

207605

MAY, 2019

B.TECH. (EL)-VI SEMESTER

DIGITAL SIGNAL PROCESSING (EC-335-C)

Time : Three Hours]

[Max Marks : 75

Note :

1. *Part-A is compulsory and attempt 4 Questions from Part-B.*
2. *Assume relevant data/figure if found missing.*

PART-A

1. (a) Differentiate between Energy and Power Signal. (1.5) CO1
- (b) Determine the step response for the LTI System represented by the following impulse response $h(n) = \delta(n) - \delta(n - 2)$. (1.5) CO1
- (c) What is the property of recursive and non-recursive systems? (1.5) CO1
- (d) Differentiate between down sampling and up sampling. (1.5) CO2
- (e) State Nyquist Theorem. 1.5 CO2
- (f) Give the relationship between z-transform and DTFT. (1.5) CO3
- (g) What is meant by radix-2 FFT. (1.5) CO3

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- (h) Explain the importance of linear phase in filter design. (1.5) CO3
- (i) How many additions, multiplications and memory locations are required to realize a system $H(z)$ having M zeros and N poles in direct form realizations. (1.5) CO4
- (j) State the advantage of cascade realization. (1.5) CO4

PART-B

2. (a) Determine the solution of the difference equation
- $$y(n) = \frac{5}{6} y(n-1) - \frac{1}{6} y(n-2) + x(n) = 2^n u(n)$$
- (10) CO1
- (b) For the given system, determine whether it is memoryless, stable, causal, linear and time invariant.
- $$y(n) = |x(n)|$$
- (5)
3. (a) State and prove sampling theorem. (8) CO2
- (b) Find the Nyquist rate for the signal
- $$x(t) = 3\cos(2000\pi t) + 5\sin(6000\pi t) + 10\cos(12000\pi t).$$
- Find the discrete time signal obtained after sampling of the signal if sampled at rate $f_s = 5000$ samples/sec. (7)
4. Find the inverse z transform

$$X(z) = \frac{z^3 - 10z^2 - 4z + 4}{2z^2 - 2z - 4} \quad \text{with ROC } |z| < 1$$

(15) CO3

5. (a) State and prove convolution property of DTFT. (8) CO3

(b) Determine the DTFT of the sequence

$$y(n) = na^n u(n) \quad |a| < 1 \quad (7)$$

6. (a) Give the similarities and differences between the Decimation in Time and Decimation in Frequency Algorithms. (8) CO3

(b) Find the DFT of the sequence $x(n) = \{1, 1, 0, 0\}$ and find the IDFT of $Y(k) = \{1.01, 0\}$ (7) CO3

7. Obtain the direct -Form-I and Direct Form-II and cascade form realization structures for the given system.

$$y(n) = -0.1 y(n - 1) + 0.72 y(n - 2) + 0.7 x(n - 0.25 x(n - 2))$$

(15) CO4
