24422

B.Tech 7th Semester (EE) F-Scheme

Examination, December–2017

DIGITAL SIGNAL PROCESSING

Paper–ECE–409–F

Time allowed : 3 hours]   [Maximum marks : 100

Note : Attempt *five* questions in all, selecting *one* question from each section. **Question number 1 is compulsory.**

1. (a) What does a Fourier transform do?   2

   (b) State and prove duality property of Fourier transform.   4

   (c) Define Region of Convergence (ROC).   2

   (d) When does aliasing occur? How can it be avoided?   4

   (e) Make a comparison between FIR and IIR.   4

   (f) Give some examples of multirate digital systems.   4

Section–A

2. Obtain Fourier transform of following signals   20

   (a) $x(t) = \cos w_o t$.

   (b) $x(t) = \sin w_o t$.

3. Determine whether the following discrete time signals are periodic or not? If periodic, determine fundamental period. $4 \times 5 = 20$

(a) $\sin 3n$

(b) $\cos 3\pi n$

(c) $\cos\left(\dfrac{n}{8}\right)\cos\left(\dfrac{n\pi}{8}\right)$

(d) $\cos\dfrac{2\pi n}{5} + \cos\dfrac{2\pi n}{6}$

(e) $e^{i\pi n}$.

Section–B

4. (a) State and prove the sampling theorem.   10

    (b) Find the inverse Z-transform of   10

    $X(Z) = 1/(1-z)^3$.

5. (a) State and prove Parseval's theorem.   10

    (b) Find the Z-transform of   10
    $x(n) = (1/3)^n\, u(-n)$.

Section–C

6. (a) Explain window technique for FIR filter design.   10

    (b) Using bilinear transformation obtain H(z) if   10

    $H(s) = \dfrac{1}{(s+1)^2}$ and $T = 0.1s$

7. (a) What is a Hamming window function? Obtain its frequency - domain characteristics.   14

(b) Describe various applications of DSP.   6

Section–D

8. Give a complete description of sampling rate conversion.   20

9. (a) Write in detail about filter structures.   10

    (b) Explain the interpolation process with an example.   10