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015602

May 2023

B.Tech. (ENC) VI SEMESTER

Digital Signal Processing (ECC-04)

Time : 3 Hours] [Max. Marks : 75

Instructions :

1. *It is compulsory to answer all the questions (1.5 marks each) of Part-A in short.*
2. *Answer any four questions from Part-B in detail.*
3. *Different sub-parts of a question are to be attempted adjacent to each other.*

PART–A

1. (a) How is the unit ramp signal defined in discrete-time function? (1.5)

(b) What is zero padding technique? (1.5)

(c) In which condition of ROC is a linear time-invariant system called BIBO stable? (1.5)

(d) Mathematically relate s-plane and z-plane. (1.5)

(e) What is ROC of a system? (1.5)

(f) List various limitations of IIR filter design by approximation of derivatives. (1.5)

(g) When a signal x[n] is anti symmetric or odd? (1.5)

(h) List basic properties of DFT. (1.5)

(i) Briefly discuss elliptic filters. (1.5)

(j) In FIR filters, which parameters remains unaffected by the quantization effect? (1.5)

PART–B

2. (a) State and prove Final Value Theorem of Z-Transform. (10)

(b) Explain parametric spectral estimation. (5)

3. (a) Describe non-probability sampling methods. (5)

(b) For analog transfer function $H(s) = 2 / (s^2 + 4s + 2)$, determine H(z) using impulse variant transformation if (a) T = 1 second and (b) T = 0.1 second. (10)

4. A continuous time filter has frequency response $H(F) = 1 / (1 + (12 \pi F / 1000))$. Determine the passband and stopband frequencies in Hz, assuming a passband ripple of 1dB and attenuation of 30 dB in the stopband. Also, determine the half power frequency F_C. (15)

5. (a) What are applications of DSP? (5)

(b) Consider the sequence $x[n]=\{2,1,-1,-3,0,1,2,1\}$. Calculate the FFT. (10)

6. (a) A Digital Filter is defined by the difference equation $y(n) = 0.99\ y(n - 1) + x(n)$. Make a plot of its magnitude. Which type of filter it is? (10)

(b) Explain Park-McClellan's Method. Where, and how, it is being applied? (5)

7. A 4-th order Butterworth filter has cut off frequency $\Omega_c = 200\ \pi$ rad./sec. Apply Bilinear Transformation with sampling frequency $F_s = 1$ kHz, determine zeros and poles in the z-plane. (15)