

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)