

Code No: 117CK

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech IV Year I Semester Examinations, January/February - 2023

DIGITAL SIGNAL PROCESSING
(Electrical and Electronics Engineering)

Time: 3 Hours

Max. Marks: 75

Note: i) Question paper consists of Part A, Part B.

ii) Part A is compulsory, which carries 25 marks. In Part A, Answer all questions.

iii) In Part B, Answer any one question from each unit. Each question carries 10 marks and may have a, b as sub questions.

PART – A**(25 Marks)**

- 1.a) Determine the stability and causality of the system with $h[n] = \left(\frac{1}{2}\right)^n u(n)$. [2]
- b) Explain the frequency representation of discrete time systems. [3]
- c) Write any two properties of DFS. [2]
- d) Differentiate between Decimation-in-time and Decimation-in-frequency. [3]
- e) Draw the parallel form structure of IIR filter. [2]
- f) What is Prewarping? [3]
- g) Give the equations for Hamming window and Blackmann window. [2]
- h) Distinguish between FIR and IIR filters. [3]
- i) What is the need for anti-aliasing filter prior to down sampling? [2]
- j) What is Dead-band of a filter? [3]

PART – B**(50 Marks)**

2. Determine the response $y(n), n \geq 0$, of the system described by the second-order difference equation $y(n) - 3y(n-1) - 4y(n-2) = x(n) + 2x(n-1)$ when the input sequence is $x(n) = 4^n u(n)$. [10]

OR

3. Obtain the direct form I, direct form II, cascade and parallel form realization for the system.
 $y(n) = -0.1y(n-1) + 0.2y(n-2) + 3x(n) + 3.6x(n-1) + 0.6x(n-2)$ [10]
- 4.a) State and prove any two properties of DFT.
- b) Establish the relation between DFT and z-transform? [5+5]

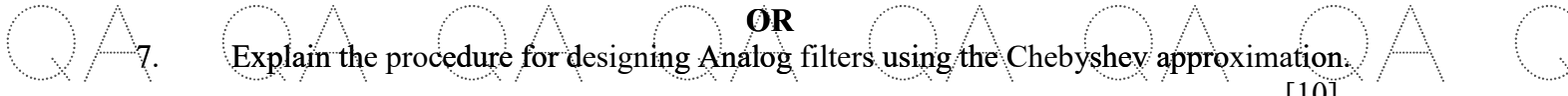
OR

5. Draw and calculate 8-point DITFET flow graph for the DFT sequence of $x[n] = \{1,1,1,1,1,1,1,1\}$ by using radix-2. [10]



6. Using Bilinear transformation, design a high pass filter, monotonic in pass band with cutoff frequency of 1000 Hz and down 10dB at 350 Hz. The sampling frequency is 5000 Hz.

[10]



OR

7. Explain the procedure for designing Analog filters using the Chebyshev approximation.

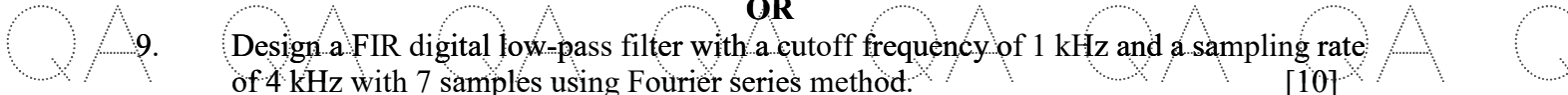
[10]

8. Design an FIR linear-phase, digital filter approximating the ideal frequency response

$$H_d(\omega) = 1 \quad \text{for } |\omega| \leq \pi/6 ;$$

$$0 \quad \text{for } \pi/6 < |\omega| \leq \pi , \text{ using a Hamming window.}$$

[10]



OR

9. Design a FIR digital low-pass filter with a cutoff frequency of 1 kHz and a sampling rate of 4 kHz with 7 samples using Fourier series method.

[10]

10. Explain about sampling rate conversion by a rational factor I/D.

[10]

OR

11.a) Write a short notes on Round-off Noise in IIR Digital Filters.

b) Explain about the methods to prevent Overflow.

[5+5]

