



## Term Evaluation (Even) Semester Examination March 2025

Roll No.....

Name of the Course: B.Tech.

Semester: Sixth

Name of the Paper: Digital Signal Processing

Paper Code: TEC 602

Time: 1.5 hour

**Maximum Marks: 50**

**Note:**

- (i) Answer all the questions by choosing any one of the sub-questions
- (ii) Each question carries 10 marks.

Q1.

*C O 1* (10 Marks)

- a. i) Explain the basic elements of Digital Signal Processing Systems. What are their advantages and disadvantages?
- ii) Determine the suitable measures of the following sequence:  
i)  $x(n)=\cos(\pi n/4)$

OR

- b. Compute and sketch energy density spectrum of signal  $x(n) = a^n u(n)$ ,  $-1 < a < 1$  using DTFT.

Q2.

*C O 1* (10 Marks)

- a. State and proof the "Sampling Theorem".

OR

- b. Determine the Fourier series spectra of the following signals.

I.  $x(n) = \cos \pi n / 3$

II.  $x(n) = \{1, 1, 0, 0\}, N = 4$

Q3.

*C O 2* (10 Marks)

- a. Prove the Radix-2, DIFFFT (Decimation- in – Frequency FFT) algorithm.

OR

- b. Use the 'DFT as Linear Transformation Technique' to compute 4- point DFT of the sequence

$$x(n) = \{0, 1, 2, 3\}$$



Compare the computational complexity of DFT and FFT algorithm.

Q4.

*C O 2* (10 Marks)

- a. Proof that the multiplication of two DFTs is equivalent to circular convolution.

OR

- b. Compute the Inverse DFT for the following using FFT algorithm:

$$X(k) = \{20, -5.828 - j2.414, 0, -0.172 - j0.414, 0, -0.172 + j0.414, 0, -5.828 + j2.414\}$$





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Q5.

C02 (10 Marks)

- a. An input sequence  $x(n) = \{2, 1, 0, 1, 2\}$  is applied to DSP system having impulse

sequence  $h(n) = \{5, 3, 2, 1\}$ . Determine the output sequence produced by (a) linear convolution (b) verify the same through circular convolution.

OR

- b. Proof the efficient computation of the DFT of 2N-Point real sequences.