

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -3 EXAMINATION- 2023

B.Tech-V Semester (ECE)

COURSE CODE(CREDITS): 18B11EC511 (4)

MAX. MARKS: 35

COURSE NAME: Principles of Digital Signal Processing

COURSE INSTRUCTORS: Lt. Pragya Gupta

MAX. TIME: 2 Hour

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*Note: (a) All questions are compulsory.*

*(b) Marks are indicated against each question in square brackets.*

*(c) The candidate is allowed to make Suitable numeric assumptions wherever required for solving problems.*

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**Q1. (a)** State the advantages and disadvantages of digital filters.

**(b)** Find the Circular and Linear convolution of the following sequences:

$$x1[n]=[1,2,3,4]$$

$$x2[n]=[0,1,2,3]$$

[3+4](CO3)

**Q2.** For the analog transfer:

Determine  $H(z)$  using impulse invariant technique. Assume  $T=1$  s.

[4](CO2)

**Q3. (a)** What is Bilinear transformation? Write down its formula. Also write a minimum five properties of Bilinear transformation.

**(b)** The transfer function of an analog LPF is ,with a bandwidth of 1 rad/s. Use bilinear transform to design a digital filter with a bandwidth of 20 Hz at a sampling frequency of 60 Hz.

[4+3] (CO3, CO4)

**Q4. (a)** Write the magnitude function for Low pass Butterworth filter and draw its magnitude response for different orders.

**(b)** Design a digital Butterworth filter that satisfies the following constraints using bilinear transformation. Assume  $T=1$  s.

[3+4] (CO4, CO5)

**Q6.** Obtain the direct form realisation for

$$H(z) = \frac{1 + \frac{1}{4}z^{-1} + \frac{1}{2}z^{-2} + \frac{1}{4}z^{-3}}{1 + z^{-1} + \frac{1}{4}z^{-2} - \frac{1}{4}z^{-3} + \frac{1}{2}z^{-4}}$$

[4] (CO2)

Q7. Write a note on the following:

- a. Wrapping effect.
- b. Gibbs Phenomenon.
- c. Overlap save and overlap add methods.

[2+2+2] (CO2)

HYPER-DRAGON-2025