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B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

September / October 2023 Supplementary Examinations

Programme: B.E
Branch: Telecommunication Engineering
Course Code: 15TE4DCCTS
Course: CONTINUOUS TIME SIGNAL PROCESSING

Semester: IV
Duration: 3 hrs.
Max Marks: 100
Date: 14.09.2023

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

UNIT - I

1   a)   Sketch the signal $x(t) = 3u(t) - u(t-2) - u(t-3)$ **06**

b)   Describe the classification of signals with an example each   **08**

c)   A continuous time LTI system is represented by the impulse response $h(t) = e^{-2t}u(t+1)$. Determine (i) stability and (ii) causality   **06**

UNIT - II

2   a)   Consider a LTI system with unit impulse response $h(t) = u(t-1)$. If the input applied to this system is $x(t) = e^{-2t}u(t)$. Find the output y(t) of the system. Also sketch y(t).   **10**

b)   Draw Direct form I and Direct form II structures for the LTI system described by
$$2\frac{d}{dt}y(t) + 2y(t) = 7x(t)$$ **10**

OR

3   a)   Evaluate the convolution integral for
$y(t) = u(t-1) * u(-t+2)$. Also sketch y(t).   **10**

b)   Draw Direct form I and Direct form II structures for the LTI system described by
$$3\frac{d^2}{dt^2}y(t) + 2\frac{d}{dt}y(t) + 6y(t) = 8\frac{d}{dt}x(t)$$ **10**

UNIT - III

4   a)   A signal x(t) is defined as below.
$x(t) = e^{-2t}u(t-1)$
Find the Fourier Transform of x(t)   **08**

b)   Show that shifting in time domain is multiplication by complex exponential in frequency domain   **06**

c) Find the inverse Fourier Transform for   **06**

$$X(\omega) = \frac{-j\omega}{(j\omega)^2 + 3(j\omega) + 2}$$

UNIT - IV

5   a)   Evaluate Fourier series for the signal $x(t) = 4\sin(\pi t) - 3\cos(2\pi t)$. Also sketch   **10**
the magnitude and phase spectra.

    b)   Find the frequency response and impulse response of the system for th   **10**
following input x(t) and output y(t)
$$x(t) = e^{-6t}u(t) \qquad y(t) = e^{-5t}u(t) + e^{-3t}u(t)$$

OR

6   a)   Evaluate Fourier series for the signal $x(t) = \cos(2t) + \sin(6t)$. Also sketch the   **10**
magnitude and phase spectra.

    b)   Find the differential equation representation for the impulse response   **10**

$$X(S) = \frac{-s}{(s)^2 + 3(s) + 2}$$

UNIT - V

7   a)   Derive the expression for 2nd order low pass Butterworth filter   **08**

    b)   what is an equalizer? Explain using a block diagram   **06**

    c)   Describe analog to analog frequency transformation   **06**

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