Question Paper

Exam Date & Time: 09-Jul-2022 (09:30 AM - 12:30 PM)

MANIPAL ACADEMY OF HIGHER EDUCATION

INTERNATIONAL CENTRE FOR APPLIED SCIENCES
IV SEMESTER B.Sc.(Applied Sciences) in Engg.
END SEMESTER THEORY EXAMINATION-MAY/JUNE 2022

SIGNALS AND SIGNAL PROCESSING [IEE 241]

Marks: 50 **Duration: 180 mins.**

Answer all the questions.

Missing data may be suitably assumed.
Use of formula/transform table is permitted.

1) Plot the DT signal $y[n] = 1 + \delta[n]$; for all 'n'. Express $y[n]$ in terms of step functions. (2)

A)

B) Find and sketch the odd and even components of the CT signal $x(t) = \sin(100\pi t)\, u(t)$ (4)

C) Test for linearity, time-invariance, causality, and stability properties for the DT system described by (4)

$$y[n] = \sum_{k=0}^{\infty} (x[n])^k$$

2) (5)

A) A system is formed by connecting two sub-systems in cascade. The impulse responses of the sub-systems are given by $h_1(t) = e^{-2t}u(t)$ and $h_2(t) = 2e^{-t}u(t)$.

Find the overall impulse response $h(t)$ of the system. Also, determine if the system is stable and causal.

B) Consider the cascade of DT-LTI systems with impulse responses $h_1[n]$ and $h_2[n]$, respectively. Find $h_1[n]$ if $h_2[n] = \{\underline{\mathbf{1}}, -1\}$ and if the input is $x[n] = \{\underline{\mathbf{1}}, 1\}$, with an output of $y[n] = \{2, 1, \underline{\mathbf{0}}, -1, -2\}$. (5)

Note: Bold and underlined number represents the sample at $n = 0$.

3) What is the eigen function of CT-LTI systems? Prove it. (2)

A)

B) (5)