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3 (Sem–4/CBCS) ELE HC 2

2021

ELECTRONICS

(Honours)

Paper : ELE-HC-4026

(Signals and Systems)

Full Marks : 60

Time : Three hours

***The figures in the margin indicate
full marks for the questions.***

Group–A

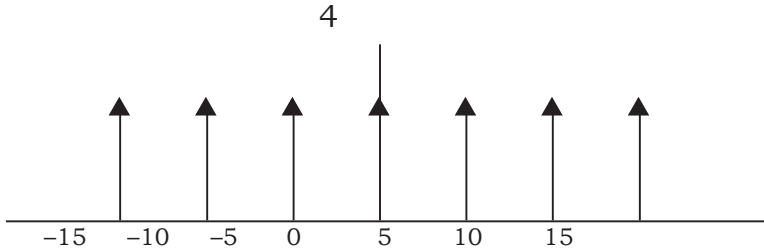
(Marks : 30)

1. Answer the following questions : $1 \times 5 = 5$
 - (a) Define a step function.
 - (b) Give *one* example of Discrete-time signal.
 - (c) What is convolution ?
 - (d) Write the mathematical expression of Laplace Transform.
 - (e) What is a periodic signal ?

Contd.

2. Answer the following questions : $2 \times 5 = 10$
- (a) Define and draw Ramp function.
 - (b) Write *two* properties of Discrete-time Fourier series.
 - (c) What is the Fourier Transform of Impulse Function ?
 - (d) Define even signal and odd signal.
 - (e) Write the associative property of convolution.
3. Answer **any three** of the following questions : $5 \times 3 = 15$
- (a) Finite sequence $x[n]$ is as,
 $x[n] = \{5, 3, -3, 0, 4, -2\}$. Find $X[z]$.
 - (b) Give an example for each of the following :
 - (i) Linear system
 - (ii) Exponential function
 - (iii) System with memory
 - (iv) Causal System
 - (v) Stable system.
 - (c) Find Discrete convolution, if
 $x[n] = \{1, 2, 1, -1\}$ and $h[n] = \{1, 3, -2, 1\}$.

(d) Find Fourier series coefficient of given Periodic Signal.



(e) If $x[n] = \{|n|, -3 \leq n \leq 3$
 $\{0, \text{ otherwise.}$

$$\text{Find } y[n] = \frac{1}{3} [x(n+1) + x(n) + x(n-1)]$$

Group - B

(Marks : 30)

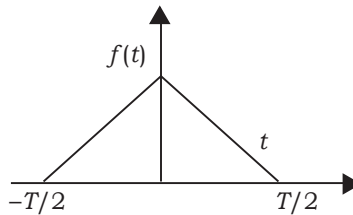
4. Answer **any three** questions from the following : 10×3=30

(a) The discrete time system is represented by the following equation in which $x(n)$ is input and $y(n)$ is output :

$$y(n) = x(n+1) - 3x(n) + 2x(n-1); \quad n=0.$$

Is this system linear or shift invariant or causal? In each case, justify your answer.

- (b) Find the Laplace Transform and ROC of $e^{-2t}u(t) + e^{-t/2}u(t)$.
- (c) Using long division method, determine the inverse z transform of—
 $X(z) = (1+2z^{-1})/(1-2z^{-1}+z^{-2})$,
 when (i) $x(k)$ is causal and (ii) $x(k)$ is anticausal.
- (d) Find the Fourier Transform for the waveform given below :



- (e) Prove that convolution in time domain is equivalent to multiplication in frequency domain.
