WEST BENGAL STATE UNIVERSITY

B.Sc. Honours 4th Semester Examination, 2020

ELSACOR09T-ELECTRONICS (CC9)

Time Allotted: 2 Hours   Full Marks: 40

The figures in the margin indicate full marks.
Candidates should answer in their own words and adhere to the word limit as practicable.
All symbols are of usual significance.

GROUP-A

Answer any *five* questions from the following $2 \times 5 = 10$

1. Determine whether the signal $Y(t) = x(-t)$ is time invariant or not.

2. Let $x(t)$ and $y(t)$ be periodic signals with fundamental periods T_1 and T_2 respectively. Under what conditions is the sum $x(t) + y(t)$ periodic and what is the fundamental period of this signal if it is periodic?

3. Determine Energy and power of unit step signal.

4. What do you mean by stability of a LTI system?

5. What will be the Laplace Transform of a Unit Step Function $u(t)$?

6. Find the Laplace transform of $4[u(t) - u(t-3)]$.

7. What are aperiodic signals? Give example.

8. What do you mean by 'discrete time periodic' signals? Give example.

9. Evaluate: $\sum_{n=0}^{\infty} \left(\frac{2}{3}\right)^{2n}$.

GROUP-B

Answer any *two* questions from the following   15×2 = 30

10.(a) If the Fourier transform of $x(t)$ is $X(\omega)$ then find the Fourier transform of $x(2t)$ (2+2)
and $x(t/2)$.

   (b) Sketch the signal $x(t) = -2u(t-1)$.   3

   (c) State the sampling theorem for low pass signal.   2

   (d) Briefly explain about causality of a system.   3

   (e) Write short note on time scaling of a signal.   3

11.(a) If $x(n)$ is the sequence of input and $y(n)$ is the response of the system then show   5
that $y(n)$ is the summation of $x(k)h(n-k)$, where $h(n)$ is the response of the
system.

   (b) The impulse response of linear time invariant system is $h(n) = \{1,2,1,1\}$.   5
Determine the response of the system to the input signal $x(n) = \{1,2,3,1\}$ using
Matrix method.

   (c) Show that the behaviour of a continuous time LTI system in the frequency   5
domain is completely characterized by its frequency response $H(\omega)$.

12.(a) With proper expressions, state the commutative, distributive and associative   5
properties of a linear time invariant system.

   (b) Taking the example of a square wave, show that Fourier series can represent any   5
wave function as an infinite sum of sinusoids.

   (c) Find the Fourier transform of $f(t) = \cos(2\pi s t)$.   5

13.(a) State and prove the time-shifting property of Laplace Transform.   5

   (b) Consider the signals: 5

   $x(t) = \cos(2\pi t/3) + 2\sin(16\pi t/3)$,

   $y(t) = \sin(\pi t)$.

   Show that $z(t) = x(t)\,y(t)$ is periodic with fundamental time period of 6 sec.

   (c) Show that series interconnection of two linear, time-invariant systems is itself a   5
linear and time-invariant system.

N.B. : *Students have to complete submission of their Answer Scripts through E-mail / Whatsapp
to their own respective colleges on the same day / date of examination within 1 hour after
end of exam. University / College authorities will not be held responsible for wrong
submission (at in proper address). Students are strongly advised not to submit multiple
copies of the same answer script.*

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