

Roll No



**PRESIDENCY UNIVERSITY
BENGALURU**

**SCHOOL OF ENGINEERING
END TERM EXAMINATION - JAN 2023**

Semester : Semester III - 2021

Course Code : EEE2001

Course Name : Sem III - EEE2001 - Signals and Systems

Program : B.Tech. Electrical and Electronics Engineering

Date : 5-JAN-2022

Time : 1.00PM - 4.00PM

Max Marks : 100

Weightage : 50%

Instructions:

- (i) Read all questions carefully and answer accordingly.
- (ii) Question paper consists of 3 parts.
- (iii) Scientific and non-programmable calculator are permitted.

PART A

ANSWER ALL THE TEN QUESTIONS

10 X 2 = 20M

1. $y(t)=\sin(x(t))$, then system is time variant or time invariant
a) Time variant (CO1) [Knowledge]
b) Time invariant
c) both a& b
d) None
2. Energy of the signal $x(t)=2; 0 \leq t \leq 2$ and $x(t)=0$ elsewhere is _____
a) 8J (CO1) [Knowledge]
b) 4J
c) 2J
d) 18J
3. Unit step signal $u(t)$ is _____
a) Energy signal (CO2) [Knowledge]
b) Power signal
c) Neither energy nor power signal
d) Both a & B

4. Generally $x(2n)$ means
- a) Expanded version of $x(n)$ (CO2) [Knowledge]
 - b) Compressed version of $x(n)$
 - c) Delayed version of $x(n)$
 - d) Advanced version of $x(n)$
5. Laplace Transform of a Step function $u(t)$
- a) s (CO3) [Knowledge]
 - b) 1
 - c) $1/s$
 - d) $2s$
6. Following statement is true for continuous time unit step
- a) $u(t)=1$ for $t>0$ (CO3) [Knowledge]
 - b) $u(t)=1$ for $t<0$
 - c) $u(t)=1$ for $t=0$
 - d) None
7. The Laplace transform of $\delta(t+4)$ is
- a) e^{-2s} (CO4) [Knowledge]
 - b) e^{2s}
 - c) e^{-4s}
 - d) e^{4s}
8. Laplace Transform of a $t^2u(t)$ is
- a) $2/s$ (CO4) [Knowledge]
 - b) $1/2s$
 - c) $2/s^2$
 - d) $2/s^3$
9. To find the odd part of $x(t)$ which formula is used?
- a) $x_0(t) = 2x(t)$ (CO2) [Knowledge]
 - b) $x_e(t) = 1/2((x(t)+ x(-t)))$
 - c) $x_0(t) = 1/2((x(t)-x(-t)))$
 - d) $x_e(t) = 2x(t)$
10. The relation between a signum function and a unit step function is, $\text{sgn}(t)=$
- a) $2u(t)-1$ (CO2) [Knowledge]
 - b) $u(t)-1$
 - c) $2u(t)$
 - d) $u(t)-u(-t)$

PART B

ANSWER ALL THE FOUR QUESTIONS

4 X 10 = 40M

11. A DC voltage of 5 Volts was applied to an electrical circuit using a Battery comprising a Resistor, capacitor and a switch. All the elements are connected in series The value of Resistor is 1000 Ohms and capacitance is 3 micro-farads. The switch was initially open but at $t=0$ the switch has been closed and a transient response was observed. The battery was charging the capacitor to a steady state value. The voltage source in series with the switch gives rise to a type of Signal. After drawing the source signal, explain what will happen to the source signal if the switch is closed at $t=t_0$ instead of $t=0$ with the help of conceptual explanations. Also compute the value of the signal at $t=0$.
(CO1) [Comprehension]
12. An odd square Signal with time period T can be represented by fourier series expansion
a) Identify the fourier coefficients that will be existing
b) Compute the fourier coefficients
(CO2) [Comprehension]
13. A voltage having the Laplace transform $(4s^2 + 3s + 2) / (7s^2 + 6s + 5)$ is applied across a 2H inductor having zero initial current. It is desired to compute the current flowing through the inductor at steady state. Utilizing the Final value theorem compute the current flowing through the inductor at steady state.
(CO3) [Comprehension]
14. Fourier series are the ones that are used in applied mathematics, and especially in the field of physics and electronics, to express periodic functions such as those that comprise communications signal waveforms. It is used to represent non-sinusoidal periodic signals into harmonic components of sinusoidal signals. Referring to the above statements, state the special conditions where fourier series may not exist.
(CO2) [Comprehension]

PART C

ANSWER ALL THE TWO QUESTIONS

2 X 20 = 40M

15. A mathematician was plotting the Region of Convergence (ROC) of a given signal $x(t)$. Region of Convergence (ROC) is defined as the set of points in s-plane for which the Laplace transform of a function $x(t)$ converges. In other words, the range of $\text{Re}(s)$ (i.e. σ) for which the function $X(s)$ converges is called the region of convergence. The signal $x(t)$ is an addition of two different signals and it was observed that the ROC is $\sigma < -2$ for one signal and $\sigma > 4$ for the other signal. By referring to the above statements, express the final equation of $x(t)$ in terms of t and also comment on the stability of the signal. (Hint-The Signal $x(t)$ is a combination of exponential one sided signals).
(CO3) [Application]
16. An Even + Half wave symmetric square Signal with time period T can be represented by Fourier series expansion
a) Identify the Fourier coefficients that will be existing
b) Compute the Fourier coefficients
(CO2) [Application]
