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 **Presidency University**

**Bengaluru**

 **SCHOOL OF ENGINEERING**

**MAKEUP EXAMINATION JULY 2024**

**Date**: 18.07.2024

**Time**: 9:30 am to 12:30 pm

**Max Marks**: 100

**Weightage**: 50%

**Semester**: 2

**Course Code**: EEE 2001

**Course Name**: Signals & Systems

**Program & Sem**: B. Tech (EEE)& III

 **Instructions:**

1. *Read the question properly and answer accordingly.*
2. *Scientific and non-programmable calculators are permitted.*

**Part A (Memory Recall Questions)**

**Answer all Ten questions. Each question carries two mark. (10Qx2M=20M)**

1.The Fourier transform of e-a|t| is (CO2) [Knowledge]

a) a/a2-ꙍ2

b) 2a/a2-ꙍ2

c) 2a/a2+ꙍ2

d) 2/a2-ꙍ2

2. The Fourier transform of eatu(-t) is (CO2) [Knowledge]

a) 1/a-jꙍ

b)1/a+jꙍ

c)1/a+ꙍ

d)1/a-ꙍ

 3. Energy of the signal x(t)=2; 0<=t<=2 and x(t)=0 elsewhere is\_\_\_\_\_

(CO1) [Knowledge]

a) 8J

b) 4J

c) 2J

d)18J

 4. y(t)=sin(x(t)),then system is time variant or time invariant  (CO1) [Knowledge]

a) Time variant

b) Time invariant

c) Both a& b

d) None

5. y(t)=2 x(t) ,system is linear or nonlinear (CO1) [Knowledge]

a) Linear

b) Nonlinear

c) a& b

d) None

6. Generally x(2n) means (CO1) [Knowledge]

a) Expanded version of x(n)

b) Compressed version of x(n)

c) Delayed version of x(n)

d) Advanced version of x(n)

7. Unit step signal u(t) is\_\_\_\_ (CO1) [Knowledge]

a) Energy signal

b) Power signal

c) Neither energy nor power signal

d) Both a & B

8. The relation between a ramp function and a unit step function is, r(t)=

 (CO1) [Knowledge]

a) t2u(t)

b) 2tu(t)

c) tu(t)

d) t

9. The relation between a signum function and a unit step function is, sgn(t)=

 (CO1) [Knowledge]

a) 2u(t)-1

b) u(t)-1

c) 2u(t)

d) u(t)-u(-t)

10. x(t)=ejπt is Periodic signal with fundamental time period T=\_\_

 (CO1) [Knowledge]

a) 20 seconds

b) 0.2 seconds

c) 2 seconds

d) 0.5 seconds

**Part B (Thought Provoking Questions)**

**Answer all the questions. Each question carries Ten marks.**

**(4Qx10M=40M)**

11. 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.

 (CO2) [Comprehension]

12. 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 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 σ<-2 for one signal and σ>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) [Comprehension]

13. Fourier Series is very useful for circuit analysis, electronics, signal processing etc. The study of Fourier series is the backbone of Harmonic analysis. Harmonic analysis is used for filter design, noise and signal analysis. Harmonic analysis is also very important in power system and power electronics studies. In power network, harmonics are mainly generated by non-linear elements and switching equipment. The output waveform of an inverter circuit is given below.


 For the above waveform, identify the harmonic components which are present and compute those values.

 (CO4) [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.

 (CO3) [Comprehension]

**Part C (Problem Solving Questions)**

 **Answer any two questions. Each question carries Fifteen marks**

**(2Qx20M=40M)**

15. 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

 (CO4) [Comprehension]

16. For applications like digital signal processing operations like time shifting, amplification and scaling are performed. Referring to the above statements, Explain the concept of time shifting, scaling and reversal by drawing the updated signal x(-3t+8) for the signal x(t) given in Fig below



 (CO1, Comprehension)