

UNIT I

PART-A (2 Marks)

1. Define Signal.
2. Define system.
3. What are the major classifications of the signal?
4. Define discrete time signals and classify them.
5. Define continuous time signals and classify them.
6. Define discrete time unit step & unit impulse.
7. Define continuous time unit step and unit impulse.
8. Define unit ramp signal.
9. Define periodic signal and non-periodic signal.
10. Define even and odd signal ?
11. Define Energy and power signal.
12. Define unit pulse function.
13. Define continuous time complex exponential signal.
14. What is continuous time real exponential signal.
15. What is continuous time growing exponential signal?
16. State the BIBO criterion for stability.
17. Find whether the signal given by $x(n) = 5\cos(6n)$ is periodic
18. Write down the exponential form of the Fourier series representation of a Periodic signal?
19. Write down the trigonometric form of the fourier series representation of a periodic signal?
20. Write short notes on dirichlets conditions for fourier series.
21. State Time Shifting property in relation to fourier series.
22. State parseval's theorem for continuous time periodic signals.

Part B

1. Determine whether the following systems are linear,time invariant,causal ,stable.

$$(1) \quad y(n) = \log[x(n)]$$

$$(2) \quad y(n) = \sum_{k=0}^{\infty} x(k)$$

2. Determine whether the following systems are linear or not

$$dy(t) / dt + 3ty(t) = t^2x(t) \quad \& \quad y(n)=2x(n)+ 1 / x(n-1)$$

3. Explain the classification of signals with examples

4. Determine whether the following systems are Time-Invariant or not

$$Y(t) = t x(t) \quad \& \quad y(n) = x(2n)$$

5. (a) Find whether the signal $x(t) = 2 \cos (10 t+1) - \sin(4t-1)$ is periodic or not.

(6) Evaluate $\sum_{n=-\infty}^{\infty} e^{2n} \delta (n-2)$

(7) Find the fundamental period of the Continuous time signal

$$x(t) = 20 \cos \left(10 \pi t + \frac{\pi}{6} \right)$$

8. a) Define an energy and power signal. (4)

b) Determine whether the following signals are energy or power and calculate their energy and power.

i) $x(n)=(1/2)^n u(n)$ (4)

ii) $x(t)=\text{rect}(t/T_0)$ (4)

iii) $x(t)=\cos^2(\Omega t)$ (4)

9. a) Define unit step, ramp, pulse, impulse and exponential signals. Obtain the relationship between the unit step and unit ramp function. (10)

b) Find the fundamental period T of the signal

$$x(n)=\cos(n\pi/2)-\sin(n\pi/8)+3\cos(n\pi/4+\pi/3) \quad (6)$$

10. a) write about the elementary continuous time signal in detail.

b) Determine the power and RMS value of the following signals.

i) $x_1(t)=5\cos(50t+\pi/3)$

ii) $x_2(t)= 20\cos 50t \cos 15t$

11. a) Determine whether the following systems are linear or non-linear

$$\text{i) } \frac{dy(t)}{dt} + 3ty(t) = t^2x(t)$$

$$\text{ii) } y(n) = 2x(n) + \frac{1}{x(n-1)} \quad (8)$$

b) Determine whether the following systems are time variant Or time -invariant.

$$\text{i) } y(t) = tx(t)$$

$$\text{ii) } y(n) = x(2n) \quad (8)$$

12.. Determine whether the systems described by the following input-output equations are linear, dynamic, causal and time variant.

$$\text{i) } y_1(t) = x(t-3) + (3-t)$$

$$\text{ii) } y_2(t) = \frac{dx(t)}{dt}$$

$$\text{iii) } y_1(n) = nx(n) + bx^2(n)$$

$$\text{iv) } \text{Even}\{x(n-1)\} \quad (16)$$

13. Determine the following signals are energy or power signals

$$\text{i) } x(n) = \left(\frac{1}{4}\right)^n u(n)$$

$$\text{ii) } x(n) = \sin(\pi n/3) \quad (16)$$

14. a) Determine whether the following signal is periodic. If periodic , determine the fundamental period:

$$X(t) = 3\cos t + 4\cos(t/2)$$

$$X(t) = \cos 60\pi t + \sin 50\pi t \quad (8)$$

b) Give the equation and draw the waveform of discrete time real and complex exponential signals. (8)

15. (i) Find whether the signal $x(t) = 2\cos(10t+1) - \sin(4t-1)$ is Periodic or not. (4)

$$\text{(ii) Find } \sum_{-\infty}^{\infty} e^{2n} \delta(n-2) \quad (3)$$

(iii) List the Properties of unit impulse function. (4)

(iv) Check whether the following signal is energy or power signal.

$$x(n) = u(n) \quad (5)$$

16. i) Determine whether the following system is linear, time invariant, causal, stable and static

1. $y(n) = x^2(n)$

2. $y(n) = x(-n)$ (10)

ii) Define LTI system. List the properties of LTI system and explain (6)

17. A discrete time signal is given by $x(n) = \{1, 1, 1, 1, 2\}$

Sketch the following signals

a) $x(n-2)$ b) $x(n+1)$ c) $x(3-n)$ d) $x(n)u(n-1)$ e) $x(n-1)\delta(n-1)$ f) Even samples of $x(n)$

g) odd samples of $x(n)$