

**G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY:: KURNOOL**  
**(Autonomous)**  
**II B.Tech I SEM MID-I Examinations December-2022**  
**(ECE)**

**Subject: Signals and Systems (A30405)**

**Date: 15-12-2022**

**Time: 1 hour 30 minutes**

**SET NO: 1**

**Max. Marks: 30**

**Answer all the Questions**

1. a) Check whether the following signals are periodic or not.

(i)  $x(n) = 1 + e^{i(4\pi n/7)} - e^{j(2\pi n/5)}$       (ii)  $x(t) = e^{(-1+j)t}$

Marks: 5M	Unit: I	CO: 1	Cognitive Level: Apply
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- b) Distinguish between energy and power signals.

Marks: 5M	Unit: I	CO: 1	Cognitive Level: Understand
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**(OR)**

2. a) Find even and odd components of the following signals.

(i)  $x(t) = (1+t^3)\cos^3(10t)$       (ii)  $x(t) = \cos t + \sin t$

Marks: 5M	Unit: I	CO: 1	Cognitive Level: Apply
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- b) Explain about time shifting and time reversal operations on signals with an example?.

Marks: 5M	Unit: I	CO: 1	Cognitive Level: Understand
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3. A system is given by  $y(t) = 2tx(t) + 4$ . Check whether this system is (i) static or dynamic (ii) causal or non-causal (iii) linear or non-linear (iv) time invariant or time varying (v) stable or unstable

Marks: 10M	Unit: I	CO: 1	Cognitive Level: Apply
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**(OR)**

4. Find the Fourier transform of  $x(t) = te^{-at} u(t)$  and draw its magnitude and phase spectrum.

Marks: 10M	Unit: II	CO: 3	Cognitive Level: Apply
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5. State and prove the following properties of continuous-time Fourier transform

- (i) Linearity      (ii) Time-shifting.

Marks: 10M	Unit: II	CO: 2	Cognitive Level: Understand
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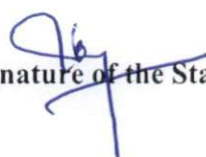
**(OR)**

6. a) Derive the relation between trigonometric and exponential Fourier series representations.

Marks: 5M	Unit: II	CO: 2	Cognitive Level: Apply
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- b) Obtain the trigonometric Fourier series representation of  $x(t) = At$  over the interval  $(0 < t < 1)$ .

Marks: 5M	Unit: II	CO: 2	Cognitive Level: Apply
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Subject: Signals and Systems (A30405)  
Time: 1 hour 30 minutes

SET NO: 2

Date: 15-12-2022  
Max. Marks: 30

**Answer all the Questions**

1. Explain about the classification of signals in detail.

Marks: 10M	Unit: I	CO: 1	Cognitive Level: Understand
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(OR)

2. a) Categorize each of the following signals as power or energy signals. Also determine either power or energy of the signals?

(i)  $x(t) = 5\cos(\pi t) + \sin(5\pi t)$       (ii)  $x(t) = \begin{cases} 5\cos(\pi t) & -1 \leq t \leq 1 \\ 0 & \text{otherwise} \end{cases}$

Marks: 5M	Unit: I	CO: 1	Cognitive Level: Apply
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- b) Explain in detail about unit impulse and unit step signals.

Marks: 5M	Unit: I	CO: 1	Cognitive Level: Understand
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3. A system is given by  $\frac{d^3}{dt^3}y(t) + 2\frac{d^2}{dt^2}y(t) + 4\frac{d}{dt}y(t) + 3y^2(t) = x(t+1)$ . Check whether this system is (i) static or dynamic (ii) causal or non-causal (iii) linear or non-linear (iv) time invariant or time varying.

Marks: 10M	Unit: I	CO: 1	Cognitive Level: Apply
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(OR)

4. Find the Fourier transform of  $\sin(\omega_0 t)$  and draw the spectrum.

Marks: 5M	Unit: II	CO: 3	Cognitive Level: Apply
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5. A rectangular function  $f(t)$  is defined by  $f(t) = \begin{cases} 1 & 0 < t < \pi \\ -1 & -\pi < t < 2\pi \end{cases}$

Approximate the above function by a wave form  $\sin t$  over an interval  $(0, 2\pi)$ , such that the mean square error is minimum.

Marks: 10M	Unit: II	CO: 2	Cognitive Level: Apply
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(OR)

6. Obtain the exponential Fourier series representation of half-wave rectified sine wave.

Marks: 10M	Unit: II	CO: 2	Cognitive Level: Apply
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**Subject: Signals and Systems (A30405)**

**Date: 15-12-2022**

**Time: 1 hour 30 minutes**

**SET NO: 3**

**Max. Marks: 30**

**Answer all the Questions**

1. (a) Check whether the following signals are periodic or not.

(i)  $2\cos(10t+1)-4\sin(4t-1)$       (ii)  $x[n]=\cos\left[\frac{\pi}{3}n\right]+\cos\left[2\frac{\pi}{3}n\right]$

Marks: 10M	Unit: I	CO: 1	Cognitive Level: Apply
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- (b) Distinguish between causal and non-causal signals with suitable examples.

Marks: 5M	Unit: I	CO: 1	Cognitive Level: Understand
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**(OR)**

2. (a) Categorize each of the following signals as power or energy signals. Also determine either power or energy of the signals?

i)  $x(t)=\begin{cases} 2 & 0\leq t\leq 1 \\ 2-t & 1\leq t\leq 2 \\ 0 & \text{otherwise} \end{cases}$       ii)  $x[n]=\begin{cases} n & 0\leq n < 5 \\ 10-n & 5\leq n\leq 10 \\ 0 & \text{otherwise} \end{cases}$

Marks: 5M	Unit: I	CO: 1	Cognitive Level: Apply
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- b) Distinguish between unit impulse and unit step functions.

Marks: 5M	Unit: I	CO: 1	Cognitive Level: Understand
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3. A system is given by  $y[n]=2nx[n]+4$ . Check whether this system is (i) static or dynamic (ii) causal or non-causal (iii) linear or non-linear (iv) time invariant or time varying (v) stable or unstable.

Marks: 10M	Unit: I	CO: 1	Cognitive Level: Apply
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**(OR)**

4. Find the Fourier transform of  $\sin(\omega_0 t)$  and draw the spectrum.

Marks: 10M	Unit: II	CO: 3	Cognitive Level: Apply
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5. Obtain the Trigonometric Fourier series representation of a function  $f(t)=At$  over the interval  $(0,2\pi)$ .

Marks: 10M	Unit: II	CO: 2	Cognitive Level: Apply
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**(OR)**

6. Find the Fourier transform of the signal.

$$f(t)=\frac{1}{2}[\delta(t+1)+\delta\left(t+\frac{1}{2}\right)+\delta\left(t-\frac{1}{2}\right)+\delta(t-1)]$$

Marks: 10M	Unit: II	CO: 2	Cognitive Level: Apply
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Subject: Signals and Systems (A30405)  
Time: 1 hour 30 minutes

**SET NO: 4**

Date: 15-12-2022  
Max. Marks: 30

**Answer all the Questions**

1. a) Find which of the following signals are causal or non – causal:  
(i)  $x(n) = u(-n)$  (ii)  $x(n) = u(n + 4) - u(n - 2)$ .

Marks: 5M	Unit: I	CO: 1	Cognitive Level: Apply
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- b) Write short notes on the following signals.  
a).Unit ramp b). Signum c).Sinc d) exponential

Marks: 5M	Unit: I	CO: 1	Cognitive Level: Understand
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**(OR)**

2. Explain in detail about the classification of systems.

Marks: 10M	Unit: I	CO: 1	Cognitive Level: Understand
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3. (a) Sketch the following signals  
(i)  $u(-t+2)$  (ii)  $-4r(t)$  (iii)  $r(-t+3)$

Marks: 5M	Unit: I	CO: 1	Cognitive Level: Apply
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- (b) Define time-variant and time –invariant systems with an example?

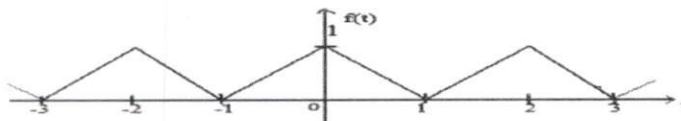
Marks: 5M	Unit: I	CO: 1	Cognitive Level: Understand
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**(OR)**

4. Find the Fourier transform of the following signals  
(i)  $x(t) = e^{-3t} u(t)$  (ii)  $x(t) = e^{-t} \cos 5t u(t)$

Marks: 10M	Unit: II	CO: 3	Cognitive Level: Apply
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5. Find the exponential Fourier series for the following periodic function.



Marks: 10M	Unit: II	CO: 2	Cognitive Level: Apply
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**(OR)**

6. State and prove any four properties of Continuous-Time Fourier Transform.

Marks: 10M	Unit: II	CO: 2	Cognitive Level: Understand
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