

Bundelkhand Institute of Engineering & Technology, Jhansi
Department of Electrical Engineering
CT-1 Paper (Session 2021-22)

Subject- Basic signal & System
Max. Marks: 15

Sem- 3rd

Subject Code-KEE 303
Time: 1 Hr

Note- Attempt any five questions out of six questions.

Q.1- What do you mean by signals. Write down the classification of signals.

Q.2- Evaluate $I = \int_{-\infty}^{\infty} \{\delta(t) \cos 2t + \delta(t-2)e^{-2t}\} dt$

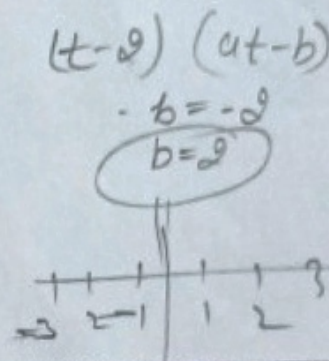
Q.3- Explain the various operations on signals.

Q.4- Write down the Standard signals with their mathematical and graphical representation.

Q.5- Draw the waveform of following signals.

(a) $X_1(t) = U(-2t+1)$ (b) $X_2(t) = U(t)-2U(t-1)+U(t-2)$ (c) $X_3(t) = U(-t)$

Q.6- Sketch the following signals derived from $X(t)$. (a) $X(4t+2)$ (b) $X(2t)$



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Bundelkhand Institute of Engineering & Technology, Jhansi
Department of Electrical Engineering
CT-2 Paper (Session 2021-22)

Subject- Basic signal & System
Max. Marks: 15

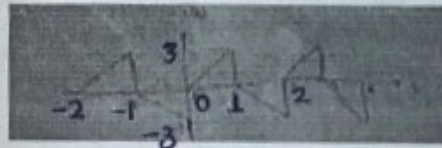
Semester- 3rd

Subject Code-KEE 303
Time: 1 Hr

Note- Attempt any five questions out of six questions.

Q.1- Check following function is periodic or not, if periodic then find its period-
 $F(t) = \cos \pi t + 2\cos 3\pi t + 3\cos \pi t$

CO1



Q.2- Calculate the power and RMS value of signal $X(t)$.

CO3

Q.3- Calculate the $X_1(n) * X_2(n)$ where $X_1(n) = \{1, 2, 3\}$ and $X_2(n) = \{1, 2, 3\}$

CO1

Q.4- Calculate the energy of given signal $X(t) = \{1+2j\}$ for $-4 < t < 4$

CO3

Q.5- Comment on following given system which are static or dynamic in nature

CO1

(i) $Y(t) = 10 x(t)$ (ii) $Y(t) = x^2(t)$ (iii) $Y(t) = x(2t)$

Q.6- Comment on Causality of following system

(i) $Y(t) = x(-t^2)$ (ii) $Y(t) = x(\sin t)$ (iii) $Y(t) = x(t) + U(t+2)$

CO3

(Roll No. to be filled by candidate)									
2	0	0	4	3	2	0	0	4	9

B. TECH.
THIRD SEMESTER THEORY EXAMINATION, 2021-22
KEE- 303
BASIC SIGNALS & SYSTEMS

Time: 03 Hours

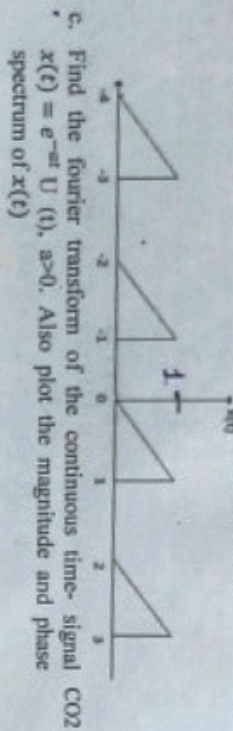
Max. Marks: 100

Note:

- Attempt all questions. All questions carry equal marks.
 - Assume missing data suitably.
1. Attempt any **FOUR** parts of the following: 4×5 CO
 - a. What do you mean by signals? Explain the various operations on signals. CO1
 - b. Write down the Standard signals with their mathematical and graphical representation CO1
 - c. Evaluate $I = \int_{-\infty}^{\infty} \{\delta(t)\cos 2t + \delta(t-2)e^{-2t}\} dt$ CO1
 - d. Draw the waveform of the following signal : CO1
 $X(t) = U(t+1) + U(-t-3) + U(-t+1) + U(t-2)$
 - e. Write down the Dirichlet conditions for Fourier series which have guaranteed to converge pointwise at all points where function is continuous. CO2
 - f. Test whether the given signals is periodic or not CO1
 - i. $x(t) = \cos t + \sin \sqrt{2}t$
 - ii. $y(t) = \cos \pi t + 2\cos 3\pi t + 3\cos \pi t$
 2. Attempt any **TWO** parts of the following: 2×10 CO
 - a. Examine the following systems with respect to causality and linearity properties. CO1
 - i. $y(t) = x(\sin t)$
 - ii. $y(t) = x(-t^2 + 2t + 1)$
 - iii. $y(t) = d/dt (x(t))$
 - iv. $y(t) = x(t^2)$

- b. Find trigonometric Fourier series of the given waveform

CO 2



- c. Find the Fourier transform of the continuous time-signal $x(t) = e^{-at} U(t)$, $a > 0$. Also plot the magnitude and phase spectrum of $x(t)$

3. Attempt any **TWO** parts of the following:

2 × 10

CO

- a. A signal has Laplace transform $X(s) = \frac{(s+2)}{(s^2+4s+5)}$. Find the Laplace transform $Y(s)$, of the following signals

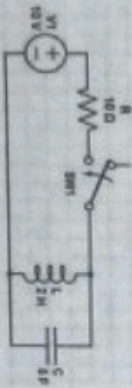
CO 3

(i) $y(t) = t x(t)$

(ii) $y(t) = e^{-t} x(t)$

- b. Initially switch is closed for a long time and steady state condition has reached. At $t = 0$ switch is opened. Find the expression of current through inductor.

CO 3



- c. State the Initial and final value theorem in Laplace transform, calculate the initial and final value of the transfer function

CO 3

$$T(S) = \frac{800}{S(S^2 + 2S + 100)}$$

4. Attempt any **TWO** parts of the following:

2 × 10

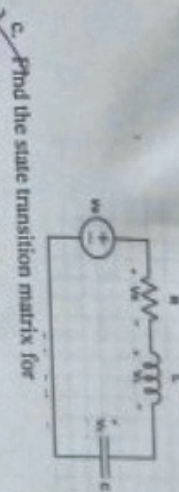
CO

- a. What do you mean by state of system? Also explain state variables and write down the advantages of state variable analysis.

CO 4

- b. Obtain the state model for the electric network shown in figure. Select I_L and V_C as state variables.

CO 4



- c. Find the state transition matrix for

CO 4

$$A = \begin{bmatrix} 0 & -1 \\ 1 & -3 \end{bmatrix}$$

5. Attempt any **TWO** parts of the following:

2 × 10

CO

- a. Explain the properties of z transform and find z transform of $X(n) = a^n U(n)$

CO 5

- b. Find the inverse Z transform of $X(Z) = \frac{1+Z^{-1}}{1+\frac{1}{3}Z^{-1}}$ by Long

CO 5

- c. Find frequency response $H(\omega)$ and time response $h(t)$ for given differential equation:

CO 5

$$\frac{d^2 y(t)}{dt^2} + 4 \frac{dy(t)}{dt} + 3y(t) = \frac{dx(t)}{dt} + 2x(t)$$

(Roll No. to be filled by candidate)									

B. TECH.
THIRD SEMESTER THEORY EXAMINATION, 2022-23
KEE-303
BASIC SIGNALS SYSTEMS

Time: 03 Hours

Max. Marks: 100

Note:

- Attempt all questions. All questions carry equal marks.

1. Attempt any **TWO** parts of the following: 2×10 CO

- a. What is LTI? What is necessary condition for an LTI COI system to be stable? Check the following function is linear or not

$$Y(t) = x(\sin(t))$$

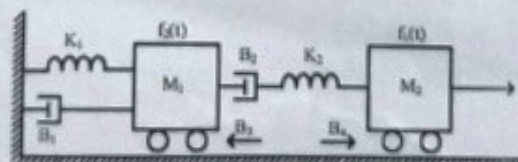
- b. i. Distinguish between Periodic and Non-periodic COI Signals. Find the time period of the signal

$$x(t) = \cos \frac{\pi}{3} t + \sin \frac{\pi}{4} t$$

- ii. Sketch the following signal

$$f(t) = u(t) + 5u(t-1) - 2u(t-2)$$

- c. Write the equivalent mathematical system for the system COI shown in fig. Also draw the force-voltage analogous circuit of this.



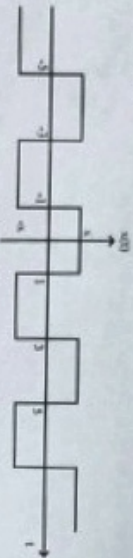
2. Attempt any **TWO** parts of the following:

2×10 CO

a. Calculate the Fourier transform of the following functions: CO2

(i) Unit Impulse sequence, $x_1[k] = \delta[k]$;(ii) Decaying exponential sequence, $x_3[k] = p^k u[k]$ with $|p| < 1$.

b. Explain the trigonometric and exponential forms of Fourier series representation of periodic signals. Find the trigonometric Fourier series for the periodic signal shown as following CO2



c. State and prove Sampling Theorem. CO2

3. Attempt any **TWO** parts of the following:

2×10 CO

a. Discuss the important properties and application of Laplace transform. Using Laplace transform solve the following differential equation: $2x''(t) + 7x'(t) + 6x(t) = 0$; given that $x(0) = 0$, $x'(0) = 1$ CO3b. A signal has Laplace transform $X(s) = \frac{s+2}{(s^2+4s+5)}$. Find the Laplace transform $Y(s)$, of the following signals CO3(i) $y(t) = tx(t)$ (ii) $y(t) = e^{-t}x(t)$

c. State and prove Convolution Theorem. CO3

4. Attempt any **TWO** parts of the following:

2×10 CO

a. What is state transition Matrix? List the important properties of state transition matrix. CO4

b. State space representation of a system is given by: CO4

$$\dot{x}(t) = \begin{bmatrix} 0 & 1 \\ -2 & -3 \end{bmatrix} x(t) + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u(t), y(t) = \begin{bmatrix} 1 & 0 \end{bmatrix} x(t)$$

where $u(t)$ is the unit step input. All the initial conditions are zero. Find the time-response of the system.

c. Find the state model of the following differential equation: CO4

$$y''' + 2y'' + 3y' + 4y = u$$

5. Attempt any **TWO** parts of the following:

2×10 CO

a. State and prove time shifting and differentiation properties of Z transform. CO5

b. Find Impulse response of the system with system function $H(z)$ is given by: CO5

$$H(z) = \frac{(2 - 2.5z^{-1})}{(1 - 0.5z^{-1})(1 - 2z^{-1})}; |z| > 2$$

c. Find Z-transform of the sequences; considering $k \geq 0$ CO5

- (i) $\delta(k)$
- (ii) $u(k)$
- (iii) $e^{\pm \beta k}$