



PAPER ID-411290

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**BTECH**  
**(SEM IV) THEORY EXAMINATION 2023-24**  
**SIGNAL SYSTEM**

**TIME: 3 HRS****M.MARKS: 70****Note: 1.** Attempt all Sections. If require any missing data; then choose suitably.**SECTION A****1. Attempt all questions in brief.****2 x 7 = 14**

|    |                                                                                  |   |
|----|----------------------------------------------------------------------------------|---|
| a. | Determine the fundamental period of the signal $x(t) = \sin(4t-1)$ .             | 2 |
| b. | Write the general formula for calculating Convolution in Continuous Time Domain. | 2 |
| c. | Find the Fourier Transform of continuous time signal $x(t) = \delta(t+1)$ .      | 2 |
| d. | Calculate the Z-Transform of discrete time signal $x(n) = \delta(n+1)$ .         | 2 |
| e. | Sketch the Sampled Signal of $x(t) = \cos(2\pi t)$ .                             | 2 |
| f. | Sketch the continuous time signal $x(t) = u(-t+1)$ .                             | 2 |
| g. | What is Parseval's Theorem?                                                      | 2 |

**SECTION B****2. Attempt any three of the following:****7 x 3 = 21**

|    |                                                                                                                                                                                                                                         |   |
|----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|
| a. | Define the following terms related to system with mathematical expressions (i) Linear System (ii) Stability (iii) Causality and (iv) Dynamic system.                                                                                    | 7 |
| b. | A causal LTI system is described by difference equation.<br>$y(n) = y(n-1) + y(n-2) + x(n-1)$<br>Find the system function $H(z) = Y(z)/X(z)$ for this system. Plot the pole-zero plot of $H(z)$ and indicate the region of convergence. | 7 |
| c. | Sketch the signal $y(t) = e^{-at}u(t)$ & find the Fourier Transform of this same signal with Magnitude & Phase Curve.                                                                                                                   | 7 |
| d. | What is ROC? Discuss any three properties of Z-Transform with mathematical expressions and example.                                                                                                                                     | 7 |
| e. | Describe Natural Sampling process with graphs and mathematical equations.                                                                                                                                                               | 7 |

**SECTION C****3. Attempt any one part of the following:****7 x 1 = 7**

|    |                                                                                                                                                                                  |   |
|----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|
| a. | Define Time Invariant system. Also check whether the given system is Time Variant or Invariant system (i) $y_1(t) = tx(t)$ , (ii) $y_2(n) = 2x(n)+3$ , (iii) $y_3(t) = 2x(-t)$ . | 7 |
| b. | Define the following with mathematical expressions and examples<br>(i) Energy & Power Signals, (ii) Even & odd Signals.                                                          | 7 |

**4. Attempt any one part of the following:****7 x 1 = 7**

|    |                                                                                                                                                                                                                    |   |
|----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|
| a. | What is Discrete Time Convolution? Find the convolution $y(n) = x(n) * h(n)$ of the discrete time signals $x(n) = h(n) = u(n)$ .                                                                                   | 7 |
| b. | What is LTI System? An LTI system is described by differential equation<br>$\frac{dy(t)}{dt} + 5y(t) = 3x(t)$<br>Calculate (i) Transfer Function, $H(s) = Y(s)/X(s)$ .<br>(ii) Output, $y(t)$ when $x(t) = u(t)$ . | 7 |



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**SIGNAL SYSTEM**

**TIME: 3 HRS****M.MARKS: 70****5. Attempt any one part of the following:****7 x 1 = 7**

|    |                                                                                                                                                                                      |   |
|----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|
| a. | Write any three properties of Fourier Transform. Find the Fourier Transform of the given signal using Properties $y(t)=te^{-4t}u(t)$ .                                               | 7 |
| b. | Determine the Inverse Laplace transform of the following functions using Partial Fraction method:<br>(i) $X(s) = \frac{4(s+3)}{s(s+1)(s+2)}$<br>(ii) $Y(s) = \frac{4}{(s+1)(s+2)^2}$ | 7 |

**6. Attempt any one part of the following:****7 x 1 = 7**

|    |                                                                                                                           |   |
|----|---------------------------------------------------------------------------------------------------------------------------|---|
| a. | Determine the Inverse Z-Transform $y(n)$ of the following functions $Y(z) = \frac{z^2}{(z^2+3z+2)}$ , given ROC $ z >2$ . | 7 |
| b. | Determine the z-transform of $x(n) = (1/2)^n u(n)$ and depict the ROC and the location of poles and zeros in the z plane. | 7 |

**7. Attempt any one part of the following:****7 x 1 = 7**

|    |                                                                                                                                                                                                                                         |   |
|----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|
| a. | Explain Ideal Sampling with time domain & frequency domain graphs and mathematical equations.                                                                                                                                           | 7 |
| b. | What is Nyquist Rate & Nyquist Interval? Calculate the Nyquist rate & Nyquist Interval for the following continuous-time sinusoidal signals (i) $x_1(t)=\cos(20\pi t)+\cos(40\pi t)$ . and (ii) $x_2(t)=\cos(200\pi t)\cos(400\pi t)$ . | 7 |