



B.Tech III Semester Regular/Supplementary Examinations, March/April 2023
SIGNALS AND SYSTEMS

(ECE)

Maximum Marks: 70

Date: 04.04.2023 Duration: 3 hours

- Note:
1. This question paper contains two parts A and B.
 2. Part A is compulsory which carries 20 marks. Answer all questions in Part A.
 3. Part B consists of 5 Units. Answer any one full question from each unit.
 4. Each question carries 10 marks and may have a, b, c, d as sub questions.

Part-A

All the following questions carry equal marks

(10x2M=20 Marks)

- 1 What is an orthogonal function?
- 2 Define a unit step.
- 3 Compare Fourier series and Fourier transform.
- 4 State the Dirichlet's conditions for existence of Fourier series.
- 5 Define Region of Convergence (ROC) in Laplace transforms.
- 6 What is the Nyquist's Frequency for the signal $x(t) = 7\cos 500t - 11\sin 300t$?
- 7 What is Cross correlation?
- 8 List out any two properties of Convolution function.
- 9 What is the significance of state transition matrix.
- 10 Define LTIV system.

Part-B

Answer All the following questions.

(10M X 5=50Marks)

- 11 Derive an expression for computing Mean Square Error in approximating a function $f(t)$ by a set of 'n' orthogonal functions. 10M
- 12 Test whether the signal $x(n) = (\frac{1}{2})^n u(n)$ energy or power signal 10M
- 13 (a) State and prove the convolution property of Fourier transform. 5M
(b) Find the Fourier transform of $x(t) = 100e^{-10t}$. 5M
- 14 (a) Determine the Fourier transform of $x(t) = e^{-at}(\cos wt) u(t)$. 5M
(b) Bring out the relationship between Trigonometric and Exponential Fourier series. 5M
- 15 (a) Why sampling theorem is called low pass sampling theorem? 5M
(b) The signal $g(t) = 10 \cos(20\pi t) \cos(200\pi t)$ is sampled at the rate of 250 samples per second. What is the Nyquist rate for $g(t)$ as a low-pass signal and determine the lowest permissible sampling rate for this signal? 5M
- 16 (a) State and prove frequency shifting property of Laplace Transform. 5M

(b) Let $X(s)=L\{x(t)\}$, Determine the initial value, $x(0)$ and the final value, $x(\infty)$, for the following signal using initial value and final value theorems. 5M

$$X(s) = \frac{7s+6}{s(3s+5)}$$

17 Determine the following functions. Given, $x(t) = A\sin(\omega t + \phi)$

(a) Auto correlation

(b) Power spectral density

5M

5M

OR

18 State and prove the properties of auto correlation function.

10M

19 (a) Formulate the relation between rise time and band width of a LPF.

5M

(b) Illustrate the conditions for distortion less transmission through a system.

5M

OR

20 (a) Describe filter characteristics of a linear system.

5M

(b) Derive the transfer function from State model.

5M