

Code No: 113AW

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B.Tech II Year I Semester Examinations, May/June - 2015

SIGNALS AND SYSTEMS
(Common to ECE, EIE, BME)

Time: 3 Hours

Max. Marks: 75

Note: This question paper contains two parts A and B.

Part A is compulsory which carries 25 marks. Answer all questions in Part A

Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

PART- A**(25 Marks)**

- 1.a) Write about unit step function and unit impulse function. [2M]
- b) What are Dirichlet conditions? [3M]
- c) State Duality Property of Fourier Transform. [2M]
- d) State Sampling Theorem. [3M]
- e) What is Paley-Wiener Criterion? [2M]
- f) Define Signal Bandwidth and System Bandwidth. [3M]
- g) Write any two properties of Correlation function. [2M]
- h) Write relation between convolution and correlation. [3M]
- i) Find the Laplace Transform of unit ramp function. [2M]
- j) What is the relationship between z-transform and DTFT? [3M]

PART-B**(50 Marks)**

- 2.a) Verify the following signals $\sin n\omega_0 t$ and $\sin m\omega_0 t$ are orthogonal not over the interval $(t_0, t_0 + 2\pi/\omega_0)$.
- b) Define the following elementary signals:
 - i) Real exponential signal.
 - ii) Continuous time version of a sinusoidal signal and bring out the relation between sinusoidal and complex exponential signals. [5+5]

OR

- 3.a) Expand following function $f(t)$ by trigonometric Fourier series over the Interval $(0,1)$. In this interval $f(t)$ is expressed as $f(t) = At$.
- b) Prove that discrete magnitude spectrum is symmetrical about vertical axis where as phase spectrum anti-symmetrical about vertical axis. [5+5]
- 4.a) Find the Fourier transform of symmetrical gate pulse and sketch the spectrum.
- b) State and prove following properties of Fourier transform:
 - i) Time shifting.
 - ii) Differentiation in time domain. [5+5]

OR

- 5.a) State and prove sampling theorem for band limited signals using analytical approach.
- b) Give introduction to band pass sampling. [5+5]

- 6.a) Derive the relationship between rise time and bandwidth.
b) Sketch the frequency response of ideal LPF, HPF and BPF. [5+5]

OR

- 7.a) What is a distortionless system? Explain.
b) Check whether the following systems are linear or not.

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

- ii) $y(n) = A x(n) + B$; where A and B are constants. [5+5]

- 8.a) Prove that the correlation and convolution functions are identical for even signals.
b) Explain about graphical procedure to perform convolution. [5+5]

OR

- 9.a) Explain detection of periodic signals in the presence of noise by Correlation.
b) Compare autocorrelation and cross correlation in detail with example. [5+5]

- 10.a) Find Laplace transforms and sketches their ROC of:

i) $x(t) = u(t-5)$

ii) $x(t) = e^{j\omega t} u(t)$.

- b) Find the inverse Laplace transform of $X(s) = (-5s-7)/(s+1)(s-1)(s+2)$. [5+5]

OR

- 11.a) Determine z - transform, pole - zero locations and sketch the ROC of following signal $x(n) = -u(-n-1) + (1/2)^n u(n)$.

- b) Find the inverse z - transform of $X(z) = (2+z^{-1})/(1-0.5z^{-1})$ with ROC $|z| > 1/2$ using power series expansion. [5+5]

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