

R13

Code No: 113AW

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**B.Tech II Year I Semester Examinations, November - 2015****SIGNALS AND SYSTEMS****(Common to ECE, EIE, BME, ETM)****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)**

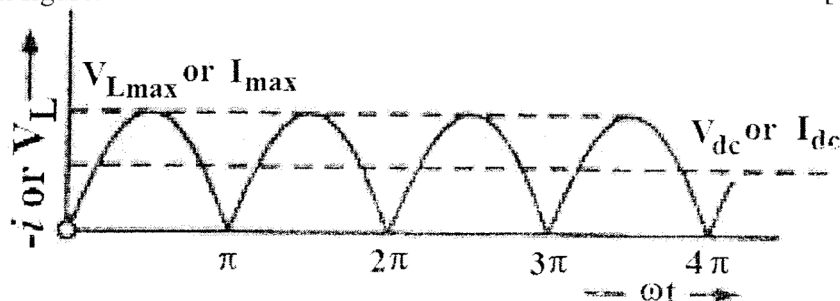
- 1.a) What is orthogonal signal space? [2M]
- b) What are Dirichlet's conditions? State them. [3M]
- c) What is anti-aliasing filter? [2M]
- d) Define Hilbert transform of a signal. [3M]
- e) What is signal bandwidth? [2M]
- f) Write the properties of the LTI systems. [3M]
- g) Define spectral density. [2M]
- h) When the convolution and correlation equivalent? [3M]
- i) What is steady state response? [2M]
- j) What is the condition for Z – transform exist? [3M]

PART-B**(50 Marks)**

- 2.a) Explain orthogonality property between two complex functions $x_1(t)$ and $x_2(t)$ for a real variable t .
- b) State the properties of the Fourier series. [5+5]

OR

- 3.a) Prove sinusoidal functions are orthogonal functions.
- b) Find the exponential Fourier series for the full wave rectified sine wave function given in figure. [5+5]



4.a) State and prove the time shifting and frequency shifting properties of Fourier transform.

b) Explain about effects of under sampling. [5+5]

OR

5.a) Find Fourier transform of $e^{-2|t|} \sin(t)$.

b) Give a continuous-time signal $x(t)$ with Nyquist rate ω_N . Determine the Nyquist rate for the following continuous-time signals:

i) $y(t) = x^2(t)$.

ii) $y(t) = x(t) \cos \omega_0 t$. [5+5]

6.a) The impulse response of a continuous-time system is expressed as:

$$h(t) = e^{-2t} u(t)$$

Find the frequency response of the system. Plot the frequency response.

b) Explain ideal filters. [5+5]

OR

7.a) What is an LTI system? Derive an expression for the transfer function of an LTI system.

b) Let the system function of an LTI system be $1/(j\omega + 3)$. What is the output of the system $y(t)$ for an input $(0.5)^t u(t)$? [5+5]

8.a) Bring out the relation between Correlation and Convolution.

b) Explain the properties of Correlation function. [5+5]

OR

9. Obtain the convolution of the following two functions:

$$x(t) = \begin{cases} 1 & \text{for } -3 \leq t \leq 3 \\ 0 & \text{otherwise} \end{cases}$$

$$h(t) = \begin{cases} 2 & \text{for } 0 \leq t \leq 3 \\ 0 & \text{otherwise} \end{cases}$$

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10. Prove that the signals $x(t) = e^{-at} u(t)$ and $x(t) = e^{-at} u(-t)$ have the same $X(s)$ and differ only in ROC. [10]

OR

11.a) Find the Laplace transform of $x(t) = \frac{5s+4}{s^2+2s+1} \text{Re}(s) < -1$.

b) State and prove integration and differentiation properties of Z – transform. [5+5]

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