Code No: 113AW

R13

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)**

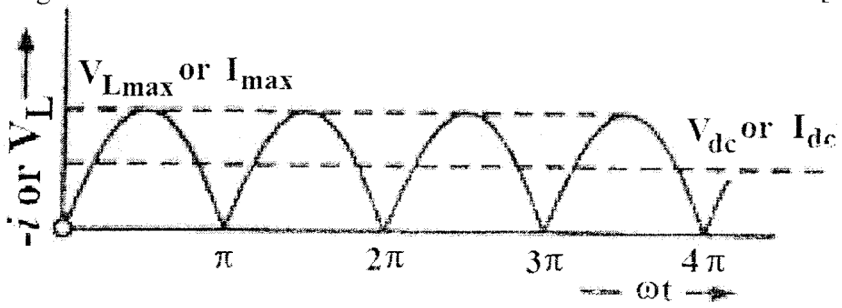
1.a)	What is orthogonal signal space?	[2M]
b)	What are Dirichlet's conditions? State them.	[3M]
c)	What is anti-aliasing filter?	[2M]
d)	Define Hilbert transform of a signal.	[3M]
e)	What is signal bandwidth?	[2M]
f)	Write the properties of the LTI systems.	[3M]
g)	Define spectral density.	[2M]
h)	When 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:

$x(t) = 1$ for $-3 \leq t \leq 3$

0 otherwise.

$h(t) = 2$ for $0 \leq t \leq 3$

0 otherwise [10]

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 $x(t) = \dfrac{5s+4}{s^2+2s+1}$ Re(s) < -1.

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

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