S.E - IV sem Biomed. 9/12/14.

Signals & Systems.

(19) **QP Code :12518**

(3 Hours) **[Total Marks : 80**

N.B.: (1) Answer any **four** questions.
(2) Assume data if required, mention **clearly**.

1. (a) Sketch the signal
$x(t) = [u(t) - u(t-4)]\, 6\, r(t)$ 5
(b) Check whether the following signal is linear or non-linear
$y(t) = 4x(t)+12$. 5
(c) Differentiate between Time Variant and Time Invariant System with suitable example. 5
(d) Compute the z-transform of the given signal
$x(n) = a^n u(n) + b^n u(n)$ 5

2. (a) Determine whether the following signals are periodic or not. If periodic, find its fundamental period.
(i) $x(t) = \cos(t+\frac{\pi}{6})$ 5
(ii) $x(n) = \sin(\frac{6\pi}{7} n+1)$ 5
(b) Find the even and odd part of the signal
(i) $x(t) = u(t) - u(t-3)$ 5
(ii) $x(n) = \{1, 2, 3, 4, 5\}$ 5
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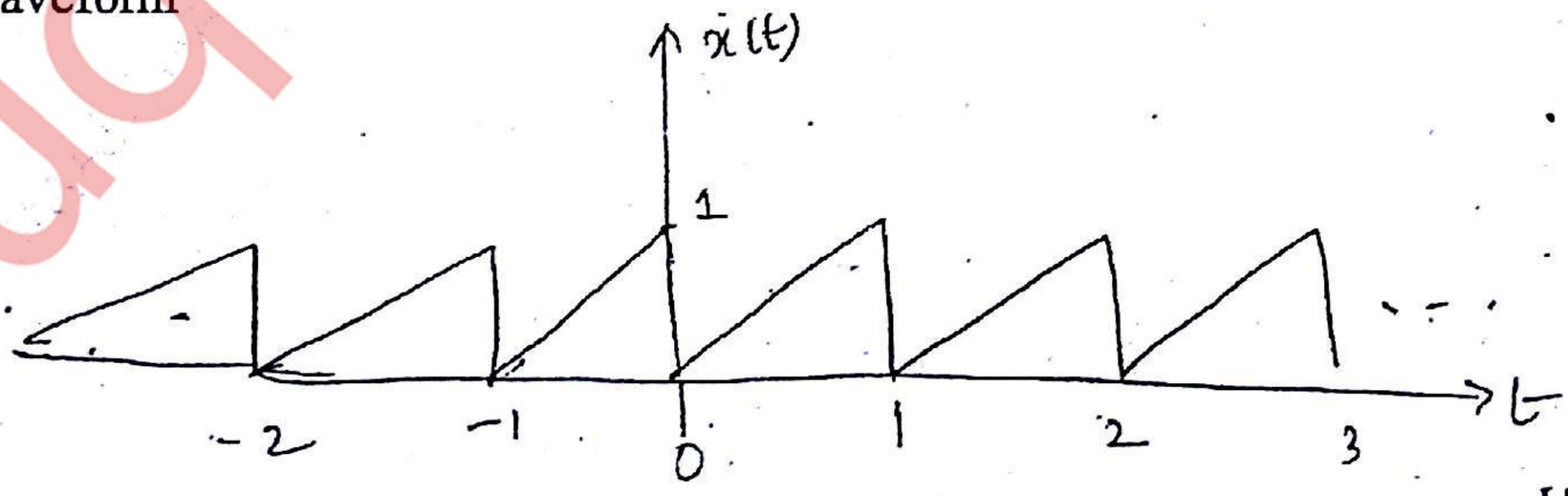
3. (a) Perform convolution operation of the two signals given below 10
$x(t) = e^{-4t} u(t),\ h(t) = u(t)$
(b) Show that the signal set 10
$\{1, \cos w_0 t, \cos 2w_0 t ..., \cos n w_0 t, \sin w_0 t, \sin 2w_0 t, ... \sin m w_0 t\}$
is orthogonal over an interval to $T_0 = \frac{2\pi}{w_0}$.

4. (a) Find the exponential Fourier Series and plot the phase spectrum for the Saw tooth waveform 10



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(b) Obtain the Fourier transform of the given signal 5

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

(c) Determine the Laplace transform of the given signal 5

$x(t) = 40 \cos w_0 t\, u(t)$

5. (a) Check whether th given signal is Energy or power 5

$x(t) = u(t)$

(b) Perform Discrete time convolution of the given signals 5

$x(n) = \{1, 3, 5, 7\}$, $h(n) = \{1, -1, 1\}$.

(c) Prove the time shifting property of the Laplace transform. 5

(d) Explain the concept of Region of Convergence in the z-transform. 5

6. (a) Find the impulse response of the system if 6

$$H(z) = \frac{1}{1-\frac{1}{4}z^{-1}} + \frac{2}{1-3z^{-1}}$$

if the system is (i) Causal (ii) Stable.

(b) Show that if $x(t) \xrightarrow{L} X(s)$, then $x(at) \xrightarrow{L} \frac{1}{|a|} X(s)$. 6

(c) Plot the single sided spectrum of the given signal 4

$x(t) = 20\cos(100\pi t + 20°) + 6 \sin(50\pi t)$.

(d) Find the difference equation from the given transfer function 4

$$H(z) = \frac{1+\frac{1}{4}z^{-1}-\frac{1}{8}z^{-2}}{1-z^{-1}+\frac{1}{4}z^{-2}}$$
