T.E. Sem V (CBGS) ETRX. 4/12/14.

S&S.

QP Code : **14933**

(3 Hours) [Total Marks : 80

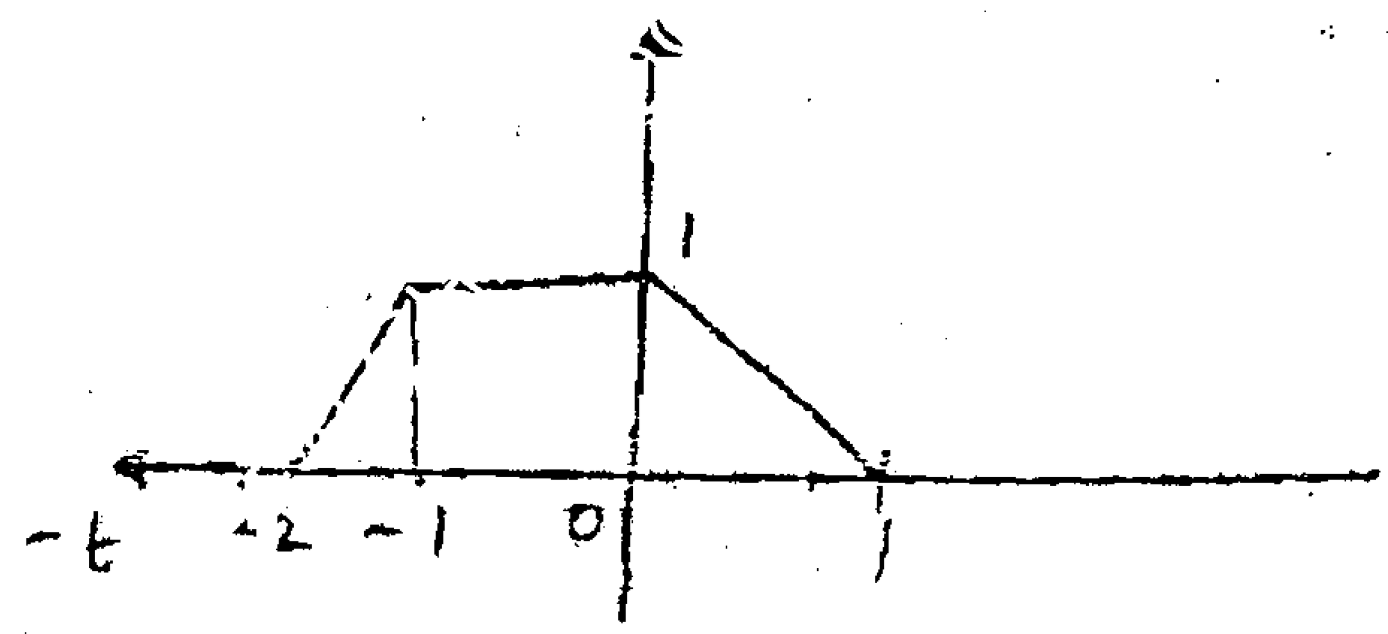
N.B : (1) Question No.1 is **compulsory**.
(2) Attempt any **three** questions from the remaining questions.
(3) **Solve** every question in a serial order.

1. (a) Prove differentiation property of Z.Transform. **20**
(b) Check if the system is Linear and time invariant.
(i) $y(t) = t^2x(t) + 3$
(ii) $y(n) = x(-n) + 3x(n+1)$
(c) Prove Time shift property of Laplace Transform.
(d) Determine energy or power of the following signals.
(i) $x(t) = 5u(t)$
(ii) $x(n) = 10\, n\, u(n)$.
(e) State Initial and final value Theorem of Z. Transform and Laplace Transform.

2. (a) Determine h(n) for all possible ROC condition. **10**

$$H(z) = \frac{z(z^2 - 3z + 11)}{\left(z - \frac{1}{4}\right)(z-4)(z+6)}$$

plot all the ROC's, poles and zeros also comment on stability at the system.
(b) Obtain even and odd parts of the signal. **5**



Also obtain and plot :
(i) $x_{even}(2t-1)$
(ii) $x_{odd}\left(\frac{t}{2}+1\right)$

(c) Determine Fourier transform of a signum signal. **5**

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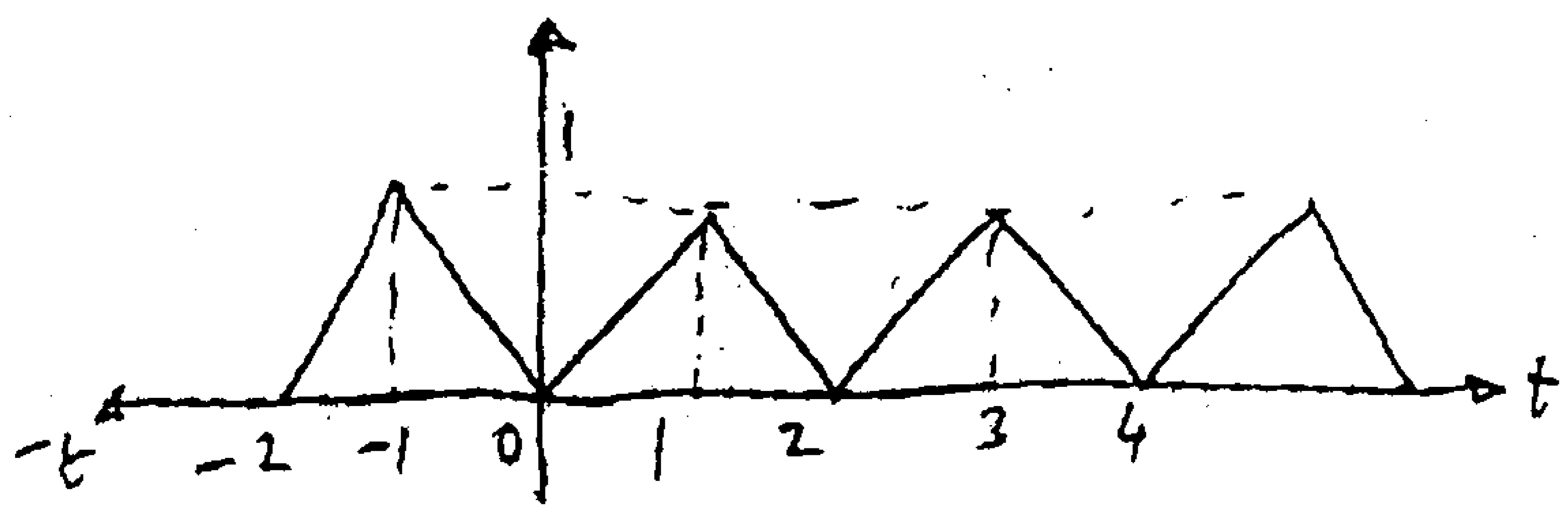
3. (a) Obtain Fourier series of the following signal. 8

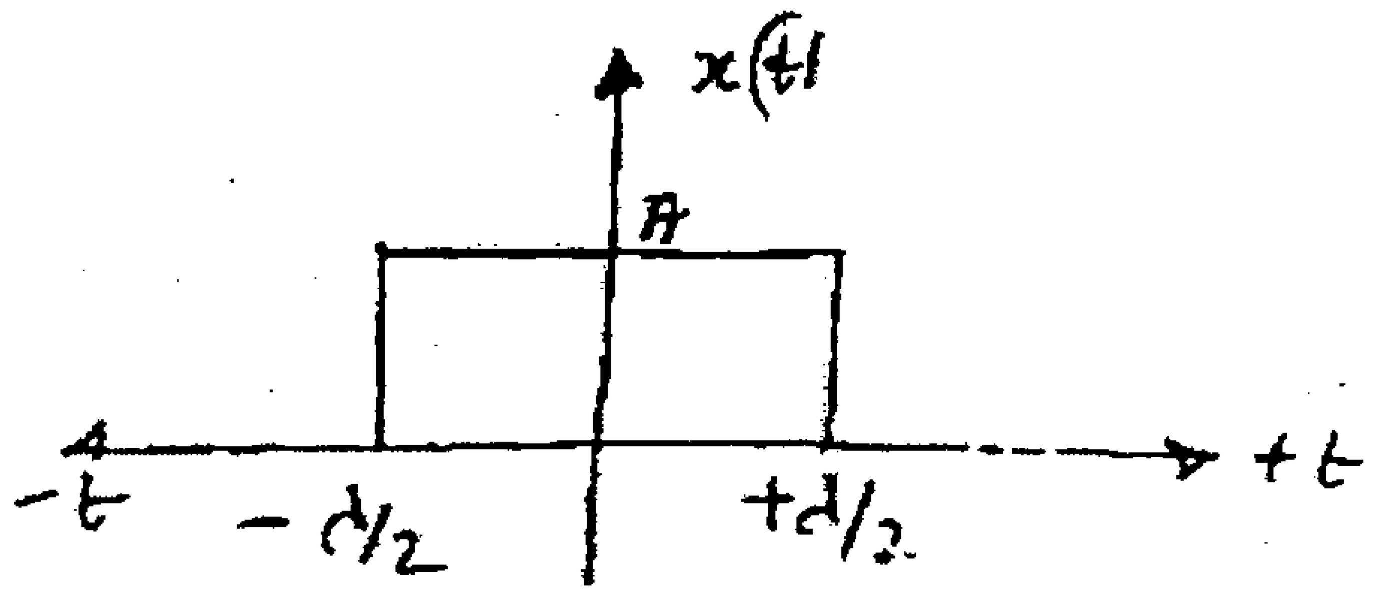


(b) Obtain Linear convolution of 6

$x(n) = 3\delta(n+3) + 2\delta(n+1) + \delta(n) - \delta(n-1)$

$h(n) = 2\delta(n+2) - 3\delta(n) + 2\delta(n-1) + 4\delta(n-2)$.

(c) Obtain Fourier transform of a rectangular pulse. 6



4. (a) A DT. LTI system is specified by 10

$y(n) = -7y(n-1) - 12y(n-2) + 4x(n-1) - 2x(n)$

$y(-1) = -2$ $y(-2) = 3$.

Determine (a) Zero input respouse

(b) Zero state response if $x(n) = (6)^n u(n)$

(c) Total response of the system.

(b) Obtain $y(t) = x(t) * h(t)$ using graphical convolution 10

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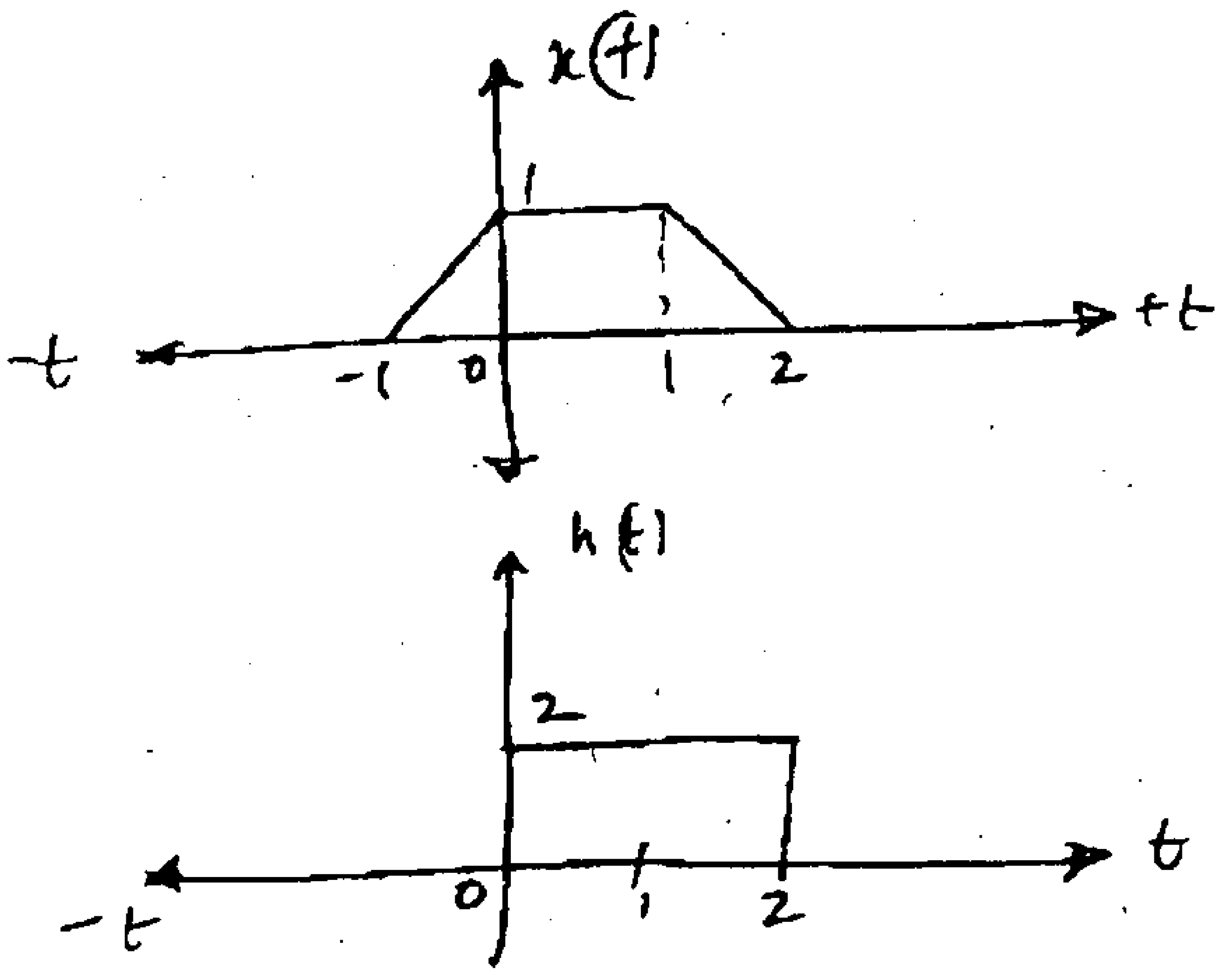

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5. (a) Obtain output response of a third order C.T. LTI non-realxed system.

$$\frac{d^3y(t)}{dt^3}+\frac{8d^2y(t)}{dt^2}+\frac{17dy(t)}{dt}+10y(t)=\frac{d^2x(t)}{dt^2}-\frac{3dx(t)}{dt}+7x(t)$$

If $y(0) = -0.5$
$y'(0) = 2$
$y''(0) = -1$

(b) Determine Z. Transform of $x(n)=(a)^n \sin[\Omega_0 n]\,u(n)$ using properties of Z.T.

(c) Obtain auto-correlation of $x_1(t)=4e^{-3t}u(t)$ 6

6. (a) Obtain overall impulse response signal of the interconnected system.

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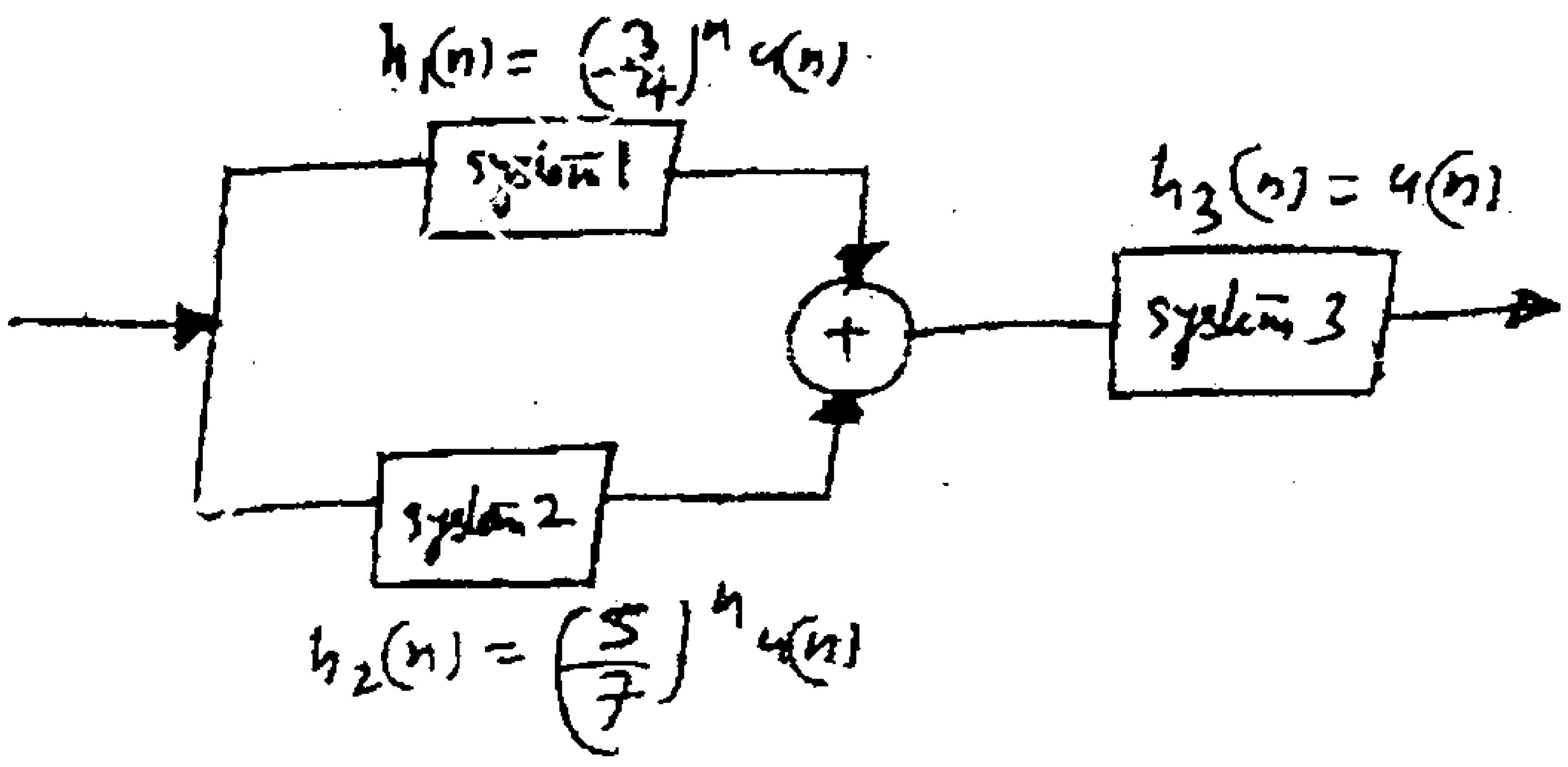

(b) Obtain Laplace Transform of
  (i) $x(t) = e^{-9t}\,u(t) + e^{+6t}\,u(-t)$
  (ii) $x(t) = (t-1)\,u(t-2) + tu(t)$

(c) Prove Parsavel's Theorem of Fouirer Transform and Fourier Series.
