

SEM-V ETRX (CBSSGS) 27/5/16  
Signals & Systems.

Q.P. Code : 31172

( 3 Hours )

[ Total Marks : 80

- N.B.: (1) Question No.1 is compulsory.  
(2) Attempt any Three out of remaining Five questions.  
(3) Assume suitable data wherever necessary.  
(4) Answer's should be in serial order.

1. (a) Check for periodicity of the following signals. Also find the new period. 20

(i)  $x(t) = 3 \cos(15\pi t) + 4 \cos\left(35\pi t - \frac{\pi}{4}\right) + 8 \sin(55\pi t)$

(ii)  $x(n) = 3 \cos^2\left(\frac{\pi}{6}n\right) + 2 \cos^2\left(\frac{\pi}{4}n\right)$

(b) Determine whether the given signal is energy or power signal. Hence obtain its energy power accordingly.

(i)  $x(t) = 4 \sin t \quad -\infty < t < \infty$

(ii)  $x(n) = \left(\frac{3}{7}\right)^n u(n)$

(c) Plot  $x(t) = u(t) - r(t) + r(t-1)$ . Hence plot its even and odd parts also.

(d) Prove time shifting property of Z - transform.

(e) Check for Dynamicity, Linearity, Time variance, causality of the system.

(i)  $y(t) = t x(t) + x(t-1)$

(ii)  $y(n) = 3x(-n) + 4.$

2. (a) Obtain inverse Z - transform for all possible ROC's. Also comment on Causality and Stability in each case. 10

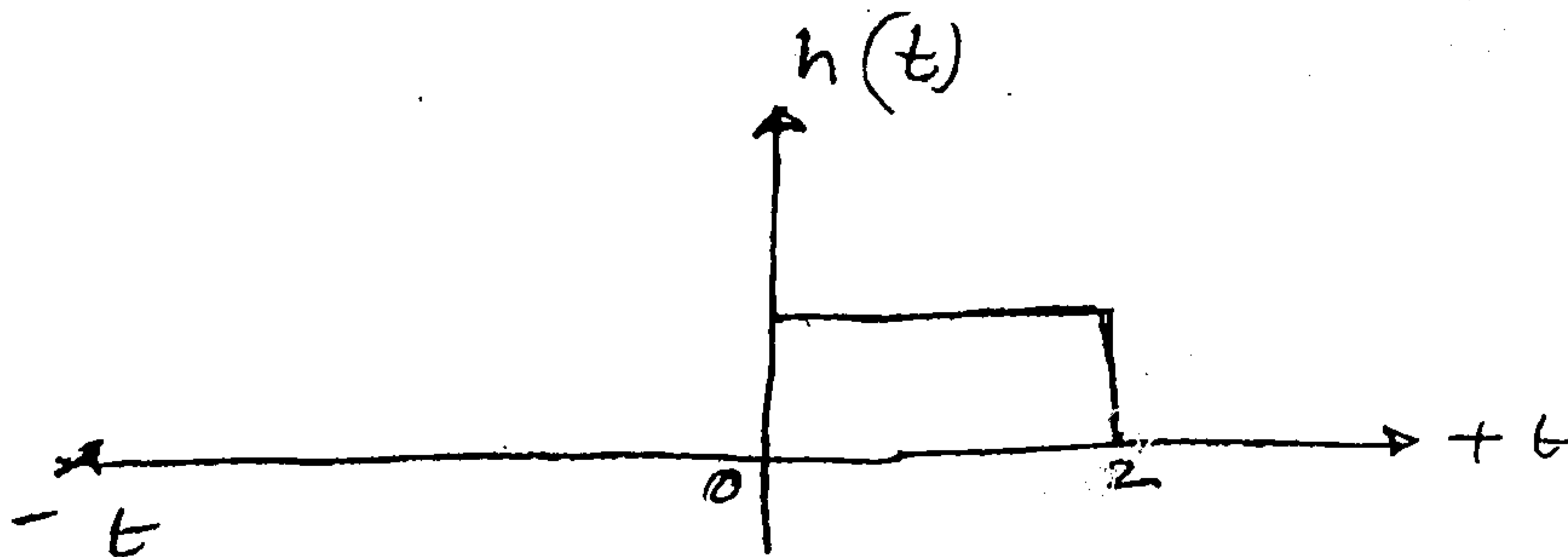
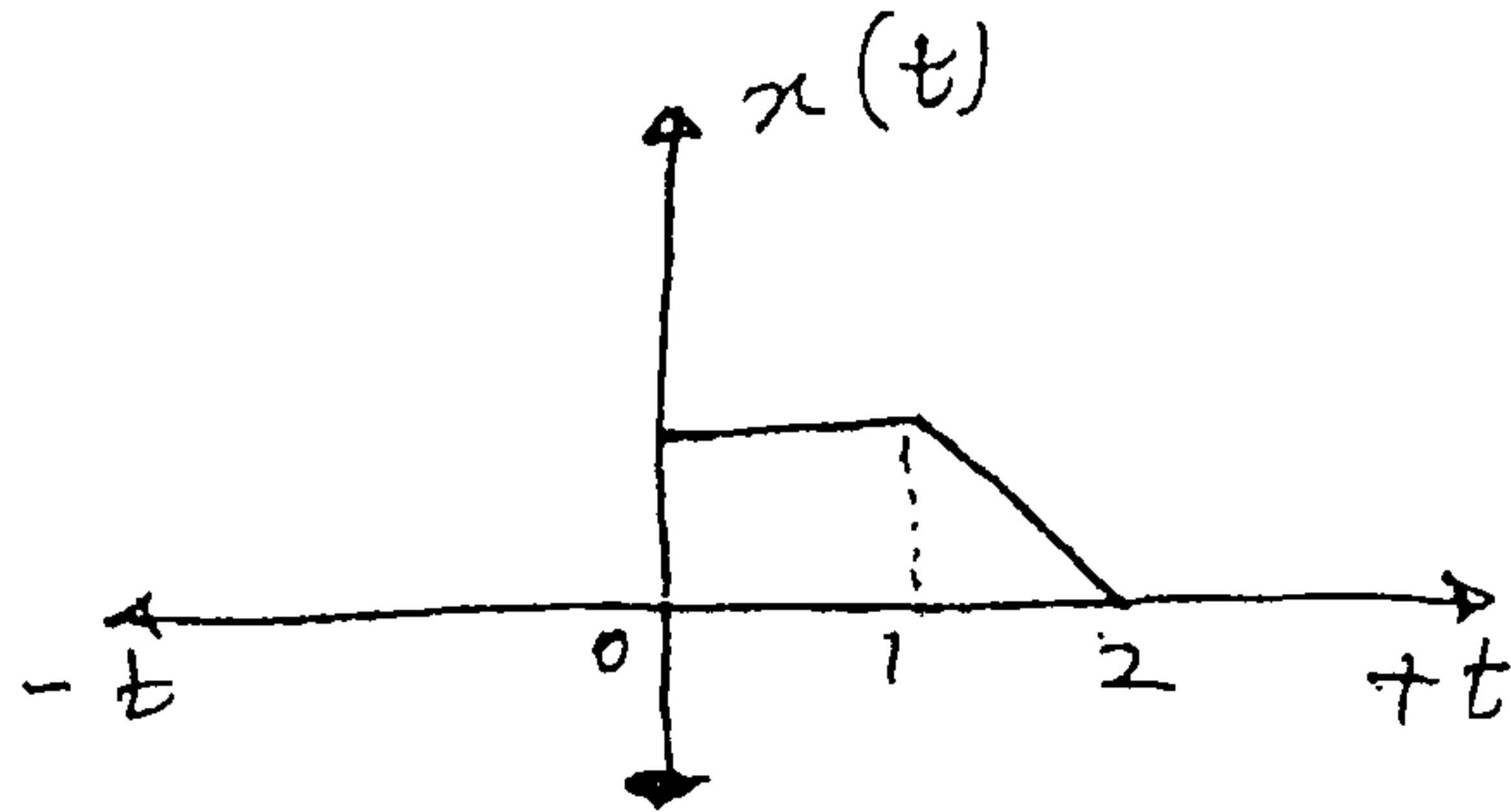
$$H(z) = \frac{z(3z-7)}{\left(z - \frac{1}{4}\right)(z+2)}$$

(b) State and prove Time Shifting and Convolution property of Continuous Time Fourier Transform. 10

TURN OVER

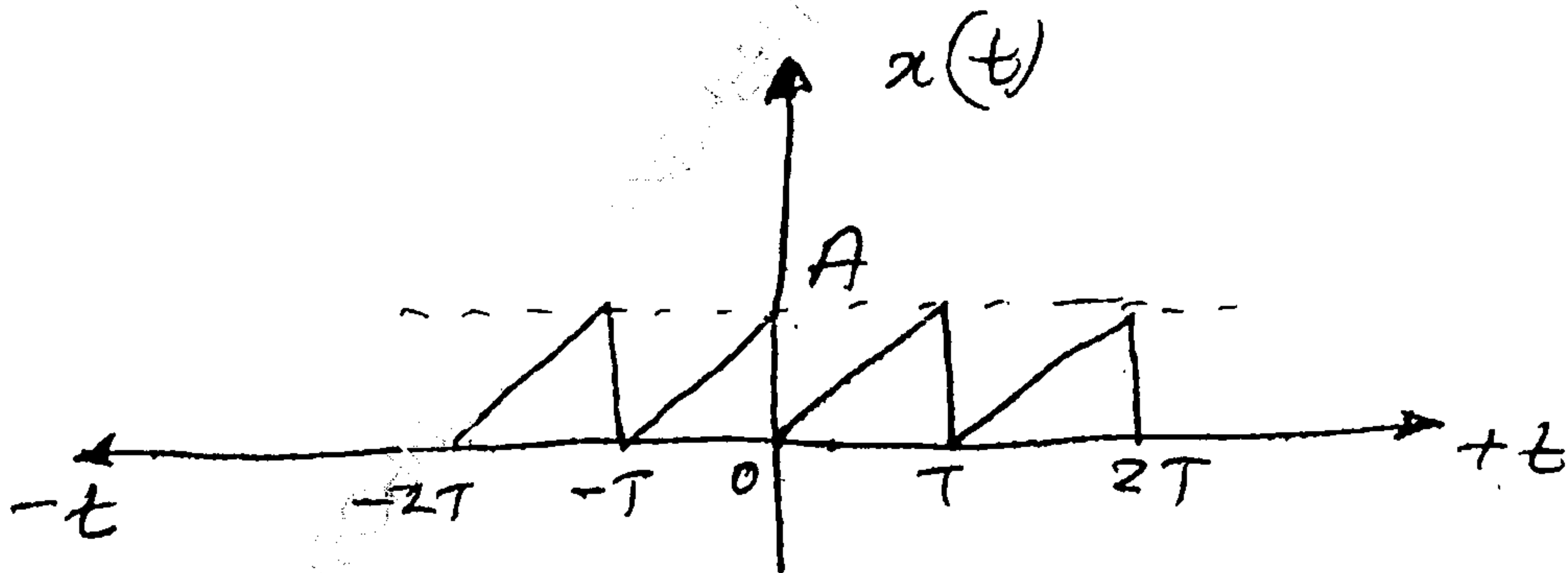
3. (a) Obtain graphical convolution of following two signals.

10



(b) Obtain exponential Fourier series of the following signal.

10



4. (a) Determine  $h(t)$  for all possible ROC's.

10

$$\text{If T. F.} = H(s) = \frac{2s + 7}{(s+2)(s-3)}$$

Also comment on Causality and Stability of the system for each case.

TURN OVER

27/5/16

Q.P. Code : 31172

3

(b) A causal DT LTI system is described as 10

$$y(n) = 3y(n-2) + 4y(n-1) + x(n)$$

Obtain : (1) T.F. of system

(2) Obtain step response

(3) Obtain response if input  $x(n) = \left(\frac{1}{2}\right)^n u(n)$ 

(4) Also plot pole's and zeros of the T.F. and comment on causality and stability.

5. (a) Determine Impulse response and step response of a CT LTI system. 10

$$\frac{d^2 y(t)}{dt^2} + \frac{7dy(t)}{dt} + 12y(t) = x(t)$$

10

(b) Obtain auto-correlation of following signals

(i)  $x(t) = 3e^{-2t} u(t)$

(ii)  $x(n) = \left(\frac{3}{4}\right)^n u(n)$

6. (a) Obtain DT Fourier Transform of following signal  $h(n) = [2 \ 1 \ 2]$  plot its magnitude and phase spectrum. 10

(b) Obtain :

(i) Z - transform of

$$x(n) = n \left(\frac{3}{4}\right)^n u(n) + u(n-1)$$

(ii) Laplace transform of

$$x(t) = t.e^{-3t} u(t) + t u(t-1)$$

Use properties of transform only.