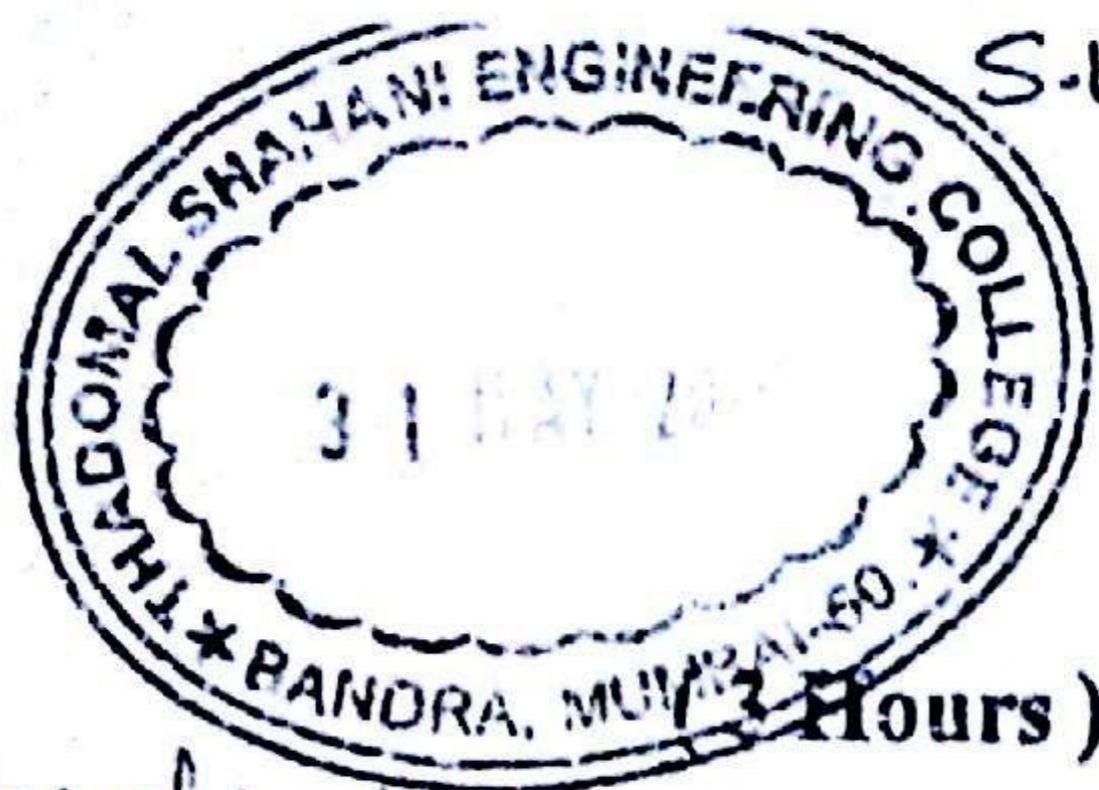


3/05/2016



S.E - IV Sem - Biomed.

Signals & Systems

SE/IV/CBGS/BM/S

Q.P. Code : 534501

3

Signals & Systems

(3 Hours)

[Total Marks : 80]

20

- N.B.:
- (1) Question No.1 is compulsory.
 - (2) Attempt any Three questions of the remaining questions.
 - (3) Assume suitable data wherever required.

1. (a) Check whether the following signals are periodic or not, if periodic, find the period.

(i) $x(n) = e^{j\left(\frac{4\pi}{7}n + \frac{\pi}{3}\right)}$,

(ii) $x(t) = e^{j\pi t}$

(b) Check whether the system is linear or not, stable or not; where $y(n)$ is the output, $x(n)$ is the input of the system.

$$y(n) = (n + 1) e^{x(n)}$$

(c) Sketch the double side and single side spectrum of the signal $x(n) = 1 + \cos(6\pi n + \pi/3) + 8 \sin(8\pi n - \pi/3)$.

(d) Find the Laplace transform of the signal

$$x(t) = e^{-2t}; \text{ specify ROC.}$$

(e) Find the Z - transform of the signal

$$x(n) = 2^{-n} \cos\left(\frac{\pi n}{4}\right) u(n); \text{ specify ROC.}$$

2. (a) Let $x(n) = u(n)$; check whether the signal is power signal or not, find the power and energy of the signal.

$$(b) x(t) = \begin{cases} 3 - |t| & |t| \leq 3 \\ 0 & \text{else where} \end{cases}$$

Sketch (i) $x(3 - t)$

(ii) $x(3t + 2)$

(iii) Find energy of the signal $x(t)$.

(c) Find the even and odd part of the signal

$$x(t) = u(t + 1) - u(t - 2).$$

5

9

6

TURN OVER

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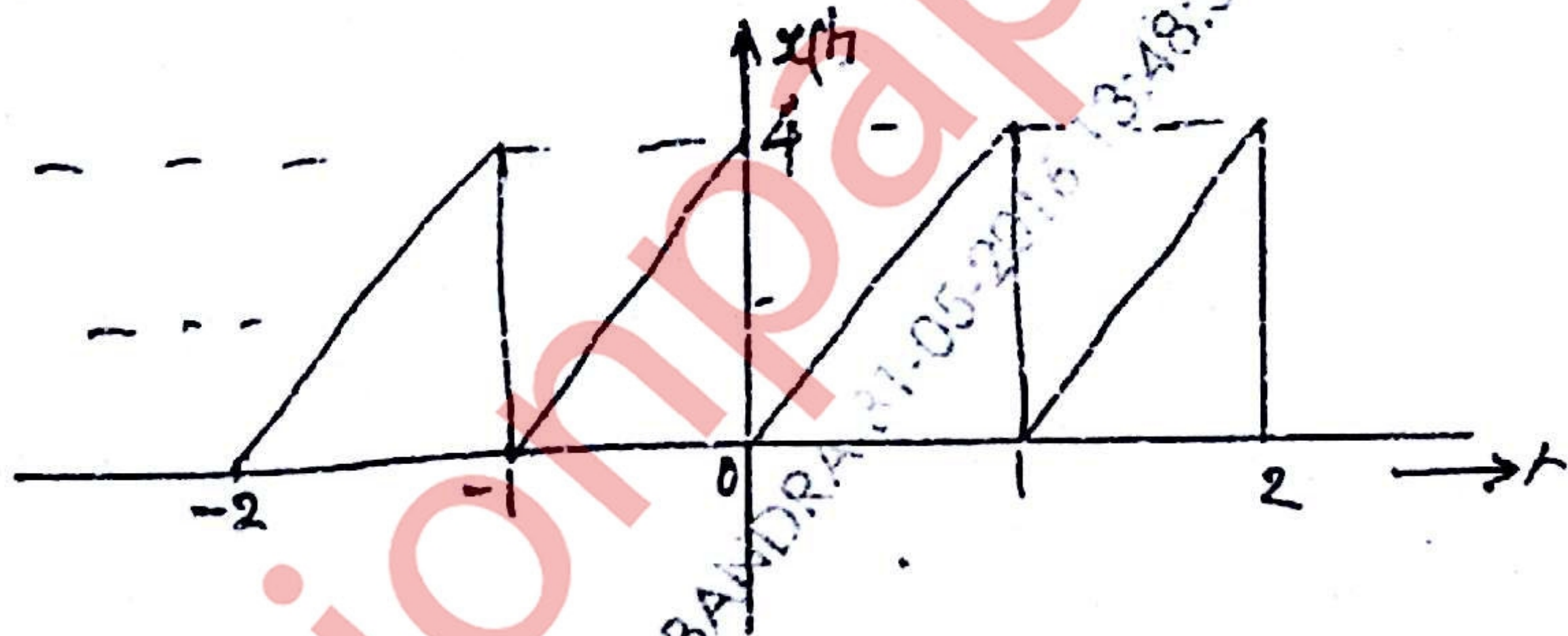
2

3. (a) Find the Linear convolution of the signal
 $x(t) = 1 \quad |t| \leq 0.5$
 $= 0 \quad \text{elsewhere}$
 $h(t) = u(t+1) - u(t-1)$; sketch the output signal. 10
- (b) Find whether the system given by the impulse response is causal or not, stable or not. 5

$$h(n) = 2^{-n} u(n+1)$$

- (c) Find $y(n) = x(n) * h(n)$ where 5
 $x(n) = [1, 2, 3, 4, -1, 6]$ $h(n) = [1, 2, -1, 2]$.

4. (a) Find the exponential Fourier series of the signal $x(t)$ as given below. Sketch the spectrum. 8



- (b) Find DTFS of the signal 6

$$x(n) = \cos\left[\frac{\pi}{2}n\right]$$

- (c) Find $x(t)$ if $X(j\omega) = \frac{j\omega + 1}{(j\omega)^2 + 6j\omega + 8}$ 6

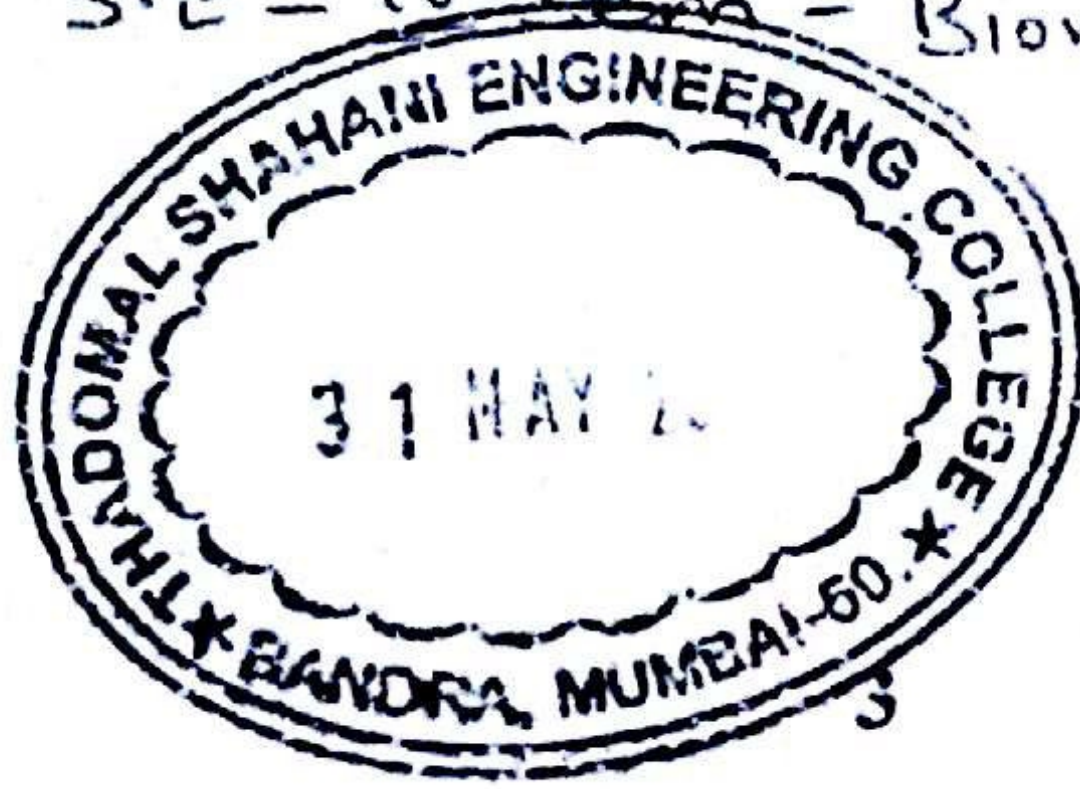
5. (a) Find DTFT of the signal 6

$$x(n) = \left(\frac{1}{2}\right)^n u(n); \text{ Find magnitude and phase spectrum.}$$

TURN OVER

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(b) Prove the convolution property of Laplace transform. 6

(c) Find $h(t)$ if $H(s) = \frac{s+5}{s^2(s+2)}$ if the system is causal. 8

6. (a) Find $x(n)$ for all possible ROC if 10

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

(b) Find the output of the system if $x(n) = [1, 2, 3, -1, 2, -1, 2]$ and $h[n] = [1, 0, -1, 1, 2]$ using linear convolution property of Z - transform. 6

(c) Prove the time shifting property of Z - transform. 4