

BTECH 3rd SEMESTER MIDTERM EXAMINATION, 2018

Name: Signal and System

Subject Code: UEC03B05

Full Mark: 50

Time: 2 Hours

Answer any five questions

- (a) Find out whether the system $y(t) = t^2 \cdot x(t-2)$ is linear, causal, time invariant and BIBO stable. Justify your answer.

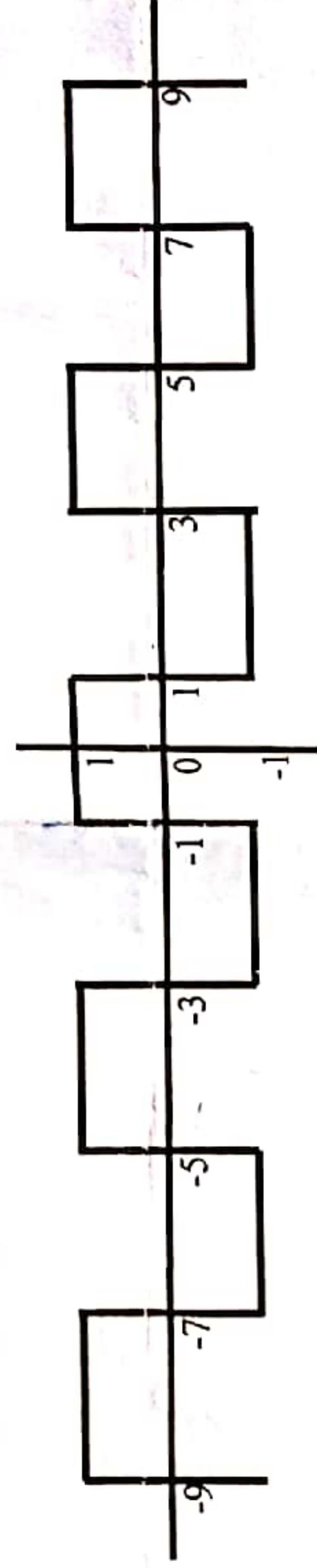
(b) Evaluate the integrals (i) $\int_{-\infty}^{\infty} \delta(t-5) \cdot t \cdot e^{-t} dt$ (ii) $\int_{-\infty}^{\infty} x(t) \delta(at-b) dt$

(c) Find whether the following signal $x[n] = e^{j\frac{2\pi}{3}n} + e^{j\frac{1}{3}n}$ is periodic or not. Justify your answer. (4+3+3)
- (a) Find the convolution of following signals

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

(ii) $x[n] = \frac{1^n}{2} u[n]; h[n] = u[n] = u[n-10]$

(b) Find the step responses of a system whose impulse response is $h[n] = (-a)^n u[n]$ (7+3)
- (a) Find the Trigonometric Fourier series for the periodic signal as given below. Write first three terms of the series.



- (b) What is Gibb's phenomenon? Explain with an example. (7+3)

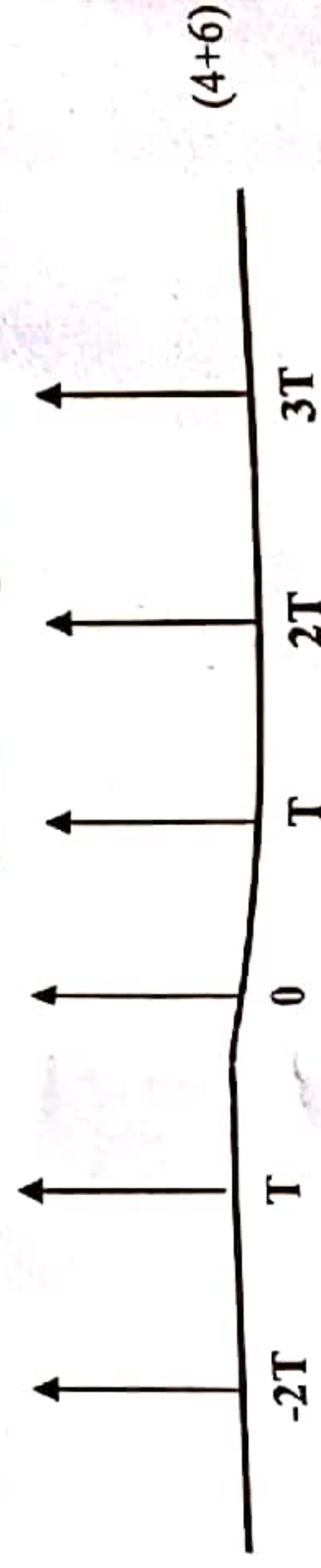
- (a) Find the Fourier transform of a rectangular pulse $\Pi(t/T)$. Draw the phase and amplitude spectrum of the signal.

(b) Find the Fourier transform of $t \cdot x(t)$ where $x(t) \Leftrightarrow F(\omega)$. With the help of this find the Fourier transform of $t \cdot e^{-at} u(t)$.

(c) Find the Fourier transform of $\text{sgn}(t)$. Draw the Magnitude spectrum of the signal. (4+3+3)

- (a) What is the half wave symmetry property in a signal? What will be the nature of its Fourier series?

(b) Find the exponential Fourier series for unit impulse train as given below



- (a) Determine the $y(t) = f(t) * h(t)$ for $f(t) = e^{-t}u(t)$ and $h(t) = 1 - e^{-2t}u(t)$.

(b) Prove that $y(t) = f(t) * h(t) = F(\omega) H(\omega)$ where $f(t) \Leftrightarrow F(\omega)$ and $h(t) \Leftrightarrow H(\omega)$.

(c) What is duality property in Fourier transform? Using that property, find the Inverse Fourier transform of $(\Pi(\omega/T))$. (3+3+4)