Bihar Engineering University, Patna
End Semester Examination - 2023

Course: B.Tech.	*Semester: IV*	*Time: 03 Hours*
Code: 110406	*Subject: Signal and System*	*Full Marks: 70*

Instructions:-

(i) The marks are indicated in the right-hand margin.
*(ii) There are **NINE** questions in this paper.*
*(iii) Attempt **FIVE** questions in all.*
*(iv) Question No. **1** is compulsory.*

Q.1 ***Choose the correct answer of the following (Any seven question only):*** **[2 x 7 = 14]**

(a) The range for unit step function for u(t – a), is _____
(i) t < a (ii) t ≤ a (iii) t = a (iv) t ≥ a

(b) Z-transform of δ(n+3).
(i) Z (ii) Z^2 (iii) 1 (iv) Z

(c) Signal x(t)=Acos(ωt+ϕ) is
(i) An energy signal (ii)A power signal
(iii) An energy as well as a power signal (iv) none

(d) Nyquist sampling rate if sinc(300t) is
(i) 600 (ii) 150 (iii) 300 (iv) 400

(e) Find the Fourier transform of $\frac{1}{1+j\,t}$
(i) $2\pi e^{a\omega}$ u(ω) (ii) $2\pi e^{a\omega}$ u(−ω) (iii) $2\pi e^{-a\omega}$ u(ω) (iv) $2\pi e^{-a\omega}$ u(−ω)

(f) When x(t) is said to be non periodic signal?
(i) If the equation x (t) = x (t + T) is satisfied for all values of T
(ii) If the equation x (t) = x (t + T) is satisfied for only one value of T
(iii) If the equation x (t) = x (t + T) is satisfied for no values of T
(iv) If the equation x (t) = x (t + T) is satisfied for only odd values of T

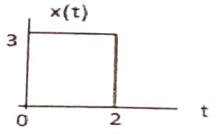
(g) Zero-state response of the system is _____
(i) Response of the system when initial state of the system is zero
(ii) Response of the system due to input alone
(iii) Response of the system due to input alone when initial state of the system is zero
(iv) Response of the system due to input alone when initial state is neglected

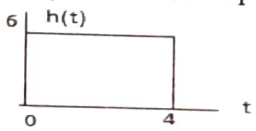
(h) Comment on the periodicity of a constant signal?
(i) It is periodic
(ii) It is not periodic
(iii) It is a mixture of period and aperiodic signal
(iv) It depends on the signal (i) Proactive (table-driven) routing protocols

(i) The energy of the signal x(n)= $(-0.4^n)u(n)is$
(i) $\frac{1}{16}$ J (ii) $\frac{1}{36}$ J (iii) $\frac{25}{21}$ J (iv) $\frac{5}{13}$ J

(j) A system is linear if it satisfy
(i) Principle of superposition (ii) Principle of homogeneity
(iii) Both (i) & (ii) (iv) Only (i)

Q.2 find the time response of LTI system with impulse response h(t) to the input x(t) **[14]**





Q.3 (a) Solve the difference equation $y[n] + 3y[n-1] = x[n]$ With initial conditions $y[-1] = 1$ and determine y[n] for the input x[n] = 7u[n]. **[7]**

(b) Find the Laplace transform and sketch ROC of signal $x(t) = -e^{at}\, u(-t)$. **[7]**

Q.4 (a) Find the discrete-time Fourier transform of $x[n] = \{1, -1, 2, 5\}$. **[4]**

(b) Find the inverse Z-transform of $X(Z) = \frac{Z(Z^2 - 4Z + 5)}{(Z-3)(Z-1)(Z-2)}$ for ROC : $2 < |Z| < 3$. **[10]**

Q.5 (a) Sketch the signal x(-2t+3) as shown in fig-1 **[10]**

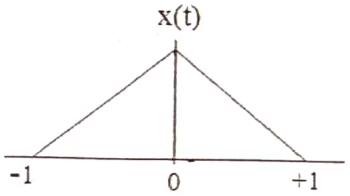


fig. 1

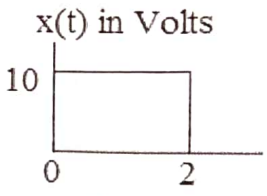
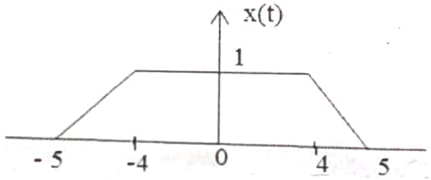


fig. 2

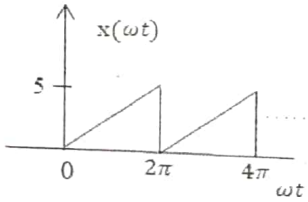
(b) Find the Fourier transform of a rectangular pulse of duration 2 second and having a magnitude of 10 volt as shown in fig. 2. **[4]**

Q.6 (a) Find Energy of the signal in given fig: **[7]**

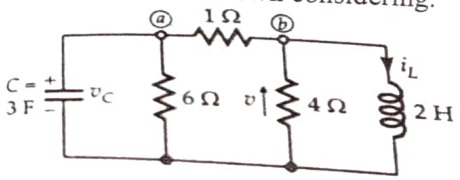


(b) Determine whether the signal is linear or non-linear $y(n) = x(n^2)$. **[7]**

Q.7 Find the trigonometric Fourier series of the periodic signal with period 2π as shown below **[14]**



Q.8 Obtain the state equation for the circuit as shown considering. **[14]**



Q.9 Write short notes on ***any two*** of the following: **[7x2=14]**

(a) Properties of z-Transform

(b) causal & non causal signals with examples

(c) Zero order hold circuit

(d) Aliasing and its effect