

## Assignment -2

**Subject: Signal and Systems**

**Sub code: EE14102**

**Class: B. Tech. IV Sem. Electrical Engineering**

**Session 2020-2021**

Q.1. Check the following responses of the following systems for linearity.

(a).  $y(n) = 9x^2(n - 1)$

(b).  $y(n) = (n)^2 x(n + 2)$

(c).  $y(t) = 7[x(t)] + 5$

Q.2 Determine whether the discrete-time systems described by the following equations are time invariant

(a).  $y(n) = F[x(n)] = a n x(n)$

(b).  $y(n) = F[x(n)] = a x(n - 1) + (bx(n - 2))$

Q.3 Check whether the following systems are linear and time invariant

(a).  $F[x(n)] = n [x(n)]^2$

(b).  $F[x(n)] = n [x(n)]^2 + bx(n)$

Q.4 Show the system described by the differential equation is non linear.

$$x(t) = \frac{d y(t)}{dt} + 10 y(t) + 5$$

Q.5 Show the system described by the differential equation is linear.

$$x(t) = \frac{d y(t)}{dt} + t y(t)$$

Q.6 Show the system described by the differential equation is non linear

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

Q.7 Check whether the following systems are linear

(a)  $F[x(n)] = a n x(n) + b$

(b)  $F[x(n)] = e^{x(n)}$

(c)  $y(n) = \frac{1}{N} \sum_{m=0}^{N-1} x(n - m)$

$$(d) y(n) = [x(n)]^2$$

Q.8 For each of the following discrete-time signals, determine whether the system is linear, shift invariant, causal and stable.

$$(a) y(n) = x(n + 7)$$

$$(b) y(n) = x^3(n)$$

$$(c) y(n) = n x(n)$$

$$(d) y(n) = \alpha + \sum_{m=0}^4 x(n - k), \alpha \text{ is non zero constant}$$

$$(e) y(n) = \alpha + \sum_{m=-4}^4 x(n - k), \alpha \text{ is non zero constant}$$

Q.9 Determine whether the following systems are linear, shift invariant, causal

$$a. y(nT) = x(nT + T) + x(nT - T)$$

$$b. y(nT) = x^2(nT + T)e^{-nT} \sin \omega nT$$

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