BACHELOR OF TECHNOLOGY (C.B.C.S.) (2020 COURSE)
B.Tech.Sem - III E&C : : SUMMER - 2022
SUBJECT : SIGNALS & SYSTEMS

Day : Thursday
Date : 2/6/2022

S-24595-2022

Time : 02:30 PM-05:30 PM
Max. Marks : 60

N.B.:
1) All questions are **COMPULSORY**.
2) Figures to the right indicate **FULL** marks.
3) Use of non-programmable **CALCULATOR** is allowed.
4) Assume suitable data if necessary.

Q.1 **a)** Sketch the following signals; [04]
   i) $u(n+2) - u(n-3)$ **ii)** $u(-n+2) \cdot u(n)$

   b) Write the classification of signals according to their characteristics. [06]

OR

Q.1 Draw the elementary continuous time signals and state its functions. [10]

Q.2 **a)** Check whether the following systems are linear or not. [06]
   i) $y(t) = e^{x(t)}$ **ii)** $y(t) = x^2(t)$ **iii)** $y(t) = t^2 x(t)$

   b) State and prove any two properties of convolution. [04]
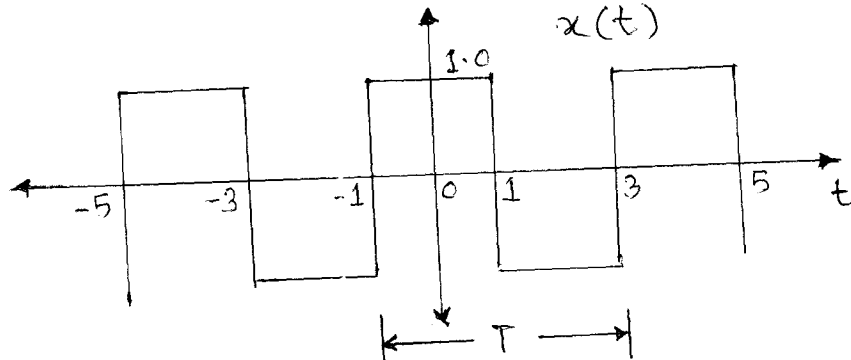
OR

Q.2 **a)** Determine the convolution sum of two sequences [06]
   $x(n) = \{1, 4, 3, 2\};$ $h(n) = \{1, 3, 2, 1\}$

   b) Determine whether system is time-variant or time invariant. [04]
   i) $y(t) = t\, x(t)$ **ii)** $y(t) = x(t) \cos(50\pi t)$

Q.3 Find the trigonometric series for the periodic signal $x(t)$ shown in figure. [10]

OR

Q.3 State and prove any four properties of continuous time Fourier series. [10]

Q.4 Determine Laplace transform of the following: [10]
   i) $x(t) = \sin \Omega_0 t\, u(t)$
   ii) $x(t) = e^{-at} \cos \Omega_0 t\, u(t)$

OR

P.T.O.

Q.4 a) Determine the inverse Laplace transform of $X(s) = \dfrac{2}{s(s+1)(s+2)^2}$. **[06]**

b) Find inverse Laplace transform using convolution theorem. **[04]**

$$X(s) = \dfrac{4}{s^2(s^2+16)}$$

Q.5 a) Determine the z transform and their ROC of the following discrete time signals: **[06]**

i) $x(n) = \{3, 2, 5, 7\}$ ii) $x(n) = \{6, 4, 5, 3\}$

b) State and prove properties of z transform using convolution theorem **[04]**

$$Z\{x_1(n) * x_2(n)\} = X_1(z)\, X_2(z)$$

OR

Q.5 Determine the inverse z transform of the following: **[10]**

i) $X(z) = \dfrac{3z^2 + 2z + 1}{z^2 + 3z + 2}$ ii) $X(z) = \dfrac{z - 0.4}{z^2 + z + 2}$

Q.6 a) What is aliasing? How it can be eliminated? **[06]**

b) State and explain sampling theorem and Nyquist criteria. **[04]**

OR

Q.6 a) Find cross-correlation of two finite length sequences **[06]**

$x(n) = \{1, 2, 1, 1\}$; $y(n) = \{1, 1, 2, 1\}$

b) State the equations for correlation of power and periodic signals. **[04]**

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