3E1148

B. Tech. III - Sem. (Main / Back) Exam., Dec. 2019
PCC Electronics Instrumentation & Control Engineering
3EI4-05 Signal & Systems
Common For EC, EI

Time: 3 Hours

Maximum Marks: 120

Instructions to Candidates:

Attempt all ten questions from Part A, five questions out of seven questions from Part B and four questions out of five from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly. Units of quantities used /calculated must be stated clearly.

Use of following supporting material is permitted during examination: (Mentioned in form No. 205)

1. NIL _____   2. NIL _____

PART – A

(Answer should be given up to 25 words only)   [10×2=20]
All questions are compulsory

Q.1   What are causal system? Why are non – causal system unrealizable?

Q.2   Cheek whether the following system is BIBO stable or not $y(n) = e^{-x(n)}$.

Q.3   State and prove convolution theorem in relation to Fourier Transform.

Q.4   How is Z– transform obtained from Laplace transform?

Q.5   Find Laplace transform of $f(t) = \left[\frac{1-e^t}{t}\right]$

Q.6   Find Z – transform for $x(n) = 2^n u(n – 2)$

Q.7 What is Aliasing? Discuss any two corrective measures to combat the effect of Aliasing.

Q.8 Let $x(n)$ be a real and odd periodic signal with period $N = 7$ and Fourier series coefficients X_K. Given that $X_{15} = j$, $X_{16} = 2j$, $X_{17} = 3j$. Determine values of X_0, X_{-1}, X_{-2}, X_{-3}.

Q.9 Sketch the following signal –

$$x(t) = r(-0.5t + 2)$$

Q.10 Evaluate $\int_{-\infty}^{\infty} e^{-2t^2} \delta(t + 5)\, dt$

PART – B

(Analytical/Problem solving questions)
Attempt any five questions

[5×8=40]

Q.1 Determine Discrete time Fourier transform of –

$$x(n) = \sin(\omega_0 n)\, U(n)$$

Q.2 Determine Laplace transform of –

$$x(t) = \cos^3(3t)\, U(t)$$

Q.3 A second order discrete time system is characterized by difference equation

$y(n) - 0.1y(n - 1) - 0.02\, y(n - 2) = 2x(n) - x(n - 1)$. Determine $y(n)$ for $n \geq 0$ when $x(n) = U(n)$ and initial condition are $y(-1) = -10$ & $y(-2) = 5$.

Q.4 Consider the continuous time signal $x(t) = \delta(t + 2) - \delta(t - 2)$. Calculate the value of energy signal E_y for the following signal:

$$y(t) = \int_{-\infty}^{t} x(\mathcal{T})\, d\mathcal{T}$$

Q.5 Find inverse Z – transform of $X(z) = e^{1/z}$ with ROC all z – plane except $|z| = 0$.

Q.6 Determine Z – transform of –

(a) $x(n) = -U(-n - 1)$

(b) $x(n) = U(-n)$

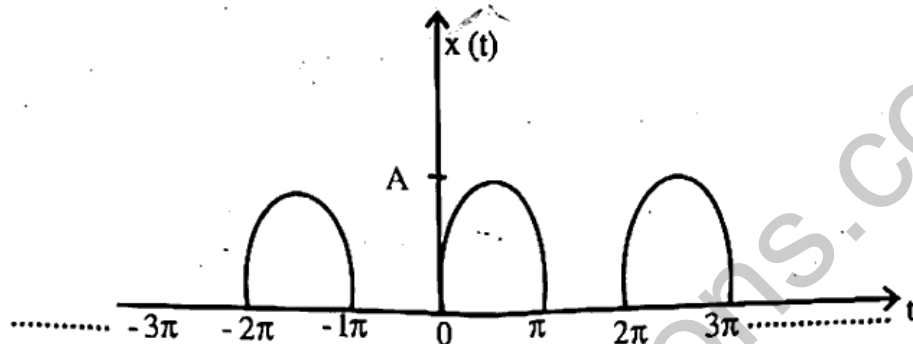Q.7 Differentiate between real and flat – top Sampling.

PART – C

Attempt any four questions

Q.1 Find trigonometric Fourier series for half wave rectified sine wave as shown in Figure, and sketch the line spectrum.
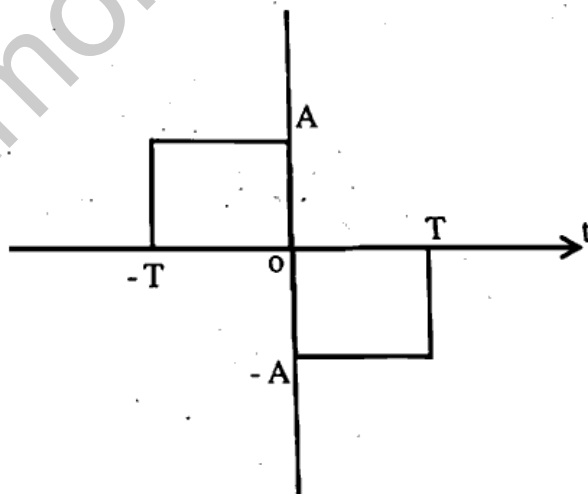

Q.2 Find state equation of a discrete time system described by –

$$y(n) - \frac{3}{4} y(n-1) + \frac{1}{8} y(n-2) = x(n) + \frac{1}{2} x(n-1)$$

Q.3 State and prove any 10 properties of Z – transform.

Q.4 Determine the magnitude and phase spectrum of the pulse.

Q5 A sine wave sin ωt is applied to the input of series RC circuit shown in Figure. Find the resultant current $i(t)$ if the switch S is closed at $t = 0$