

**3E1148**

Roll No.

Total No of Pages: **4****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. NIL2. NIL[ersahilkagyan.com](http://ersahilkagyan.com)**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 Check 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

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

- 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: <http://www.rtuonline.com>

$$y(t) = \int_{-\infty}^t x(\tau) d\tau$$

- 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.

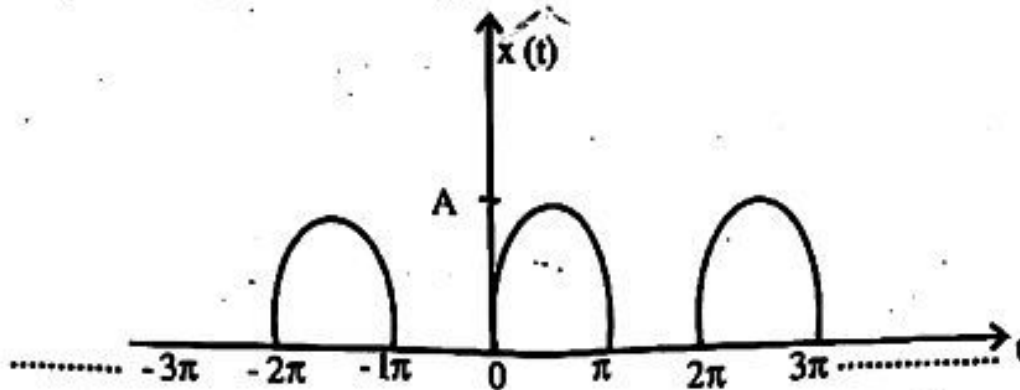
## PART - C

(Descriptive/Analytical/Problem Solving/Design Questions)

[4×15=60]

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.

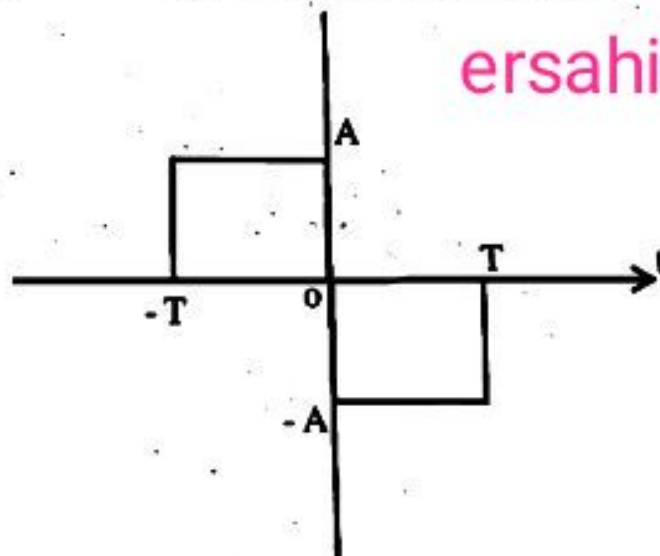


- Q.2 Find state equation of a discrete time system described by -

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

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

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



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Q.5 A sine wave  $\sin \omega t$  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  $t = 0$

