

310705

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B. Tech. III Sem. (Main) Exam., Dec. - 2019

Common for ECE/EIC

3EC2-05 Signal and Systems

Time: 3 Hours

Maximum Marks: 120

Instructions to Candidates:

Part – A: Short answer questions (up to 25 words) 10×2 marks = 20 marks. All ten questions are compulsory.

Part – B: Analytical/Problem Solving questions 5×8 marks = 40 marks. Candidates have to answer five questions out of seven.

Part – C: Descriptive/Analytical/Problem Solving questions 4×15 marks = 60 marks. Candidates have to answer four questions out of five.

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 materials is permitted during examination. (Mentioned in form No. 205)

1. NIL

2. NIL

PART - A

- Q.1 What is a Causal System? Why are non-causal systems unrealisable?
- Q.2 What are periodic signals? Give examples.
- Q.3 What is region of convergence?
- Q.4 What is the difference between DTFT and DFT?
- Q.5 Explain the use of Z – Transform.
- Q.6 Explain the time shift property of Z – Transform.

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- Q.7 What is meant by Sampling? State the sampling theorem.
Q.8 What is Aliasing Phenomenon? How can aliasing be eliminated?
Q.9 What is the difference between linear and circular convolution?
Q.10 Explain the Laplace transform.

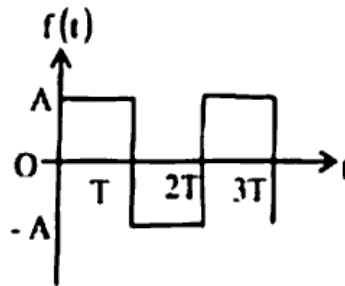
PART - B

Q.1 Determine the signal energy and signal power for -

(a) $f(t) = e^{-10t}$

(b) $f(t) = e^{-10t} u(t)$

Q.2 Find the Laplace transform of the periodic rectangular waveform shown in fig.



Q.3 Find the Z - transform of $x(n) = \cos \omega_0 n$ for $n \geq 0$

Q.4 Determine the DFT of the sequence-

$$x(n) = \begin{cases} \frac{1}{4} & \text{for } 0 \leq n \leq 2 \\ 0 & \text{otherwise} \end{cases}$$

Q.5 Find state space representation for system

$$y''(t) + 6y'(t) + 2y(t) = 0$$

Q.6 Find the Fourier transform of $f(t) = t \cos at$.

Q.7 Determine the Nyquist frequency and Nyquist rate for the following signals-

(a) $x(t) = 50 \cos (1000 \pi t)$

(b) $x(t) = 5 \sin c (5t)$

(c) $x(t) = 20 \sec t \left(\frac{1}{2} \right)$

(d) $x(t) = 2 \cos 50 \pi t + 5 \sin 300 \pi t - 4 \cos 100 \pi t$

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PART - C

Q.1 Compute (a) linear and

(b) circular periodic

convolutions of the two sequences $x_1(n) = \{1, 1, 2, 2\}$ and $x_2(n) = \{1, 2, 3, 4\}$. Also find circular convolution using the DFT and IDFT.

Q.2 Describe all the properties of Z - Transform in detail.

Q.3 Find $x(n)$ by using convolution for

$$x(z) = \frac{1}{\left(1 - \frac{1}{2}z^{-1}\right)\left(1 + \frac{1}{4}z^{-1}\right)}$$

Q.4 Plot the poles and zeros for-

$$F(s) = 4 \frac{(s+1)(s+3)}{(s+2)(s+4)} \text{ and hence obtain } f(t)$$

Q.5 Find the Fourier transform of $f(t) = \sin(\omega t + \theta)$

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