4E1323

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4E1323
B. Tech. IV - Sem. (Main / Back) Exam., - 2025
Electrical & Electronics Engineering
4EX4-07 Signals & Systems
EE, EX

Time: 3 Hours **Maximum Marks: 70**

Instructions to Candidates:

Attempt all ten questions from Part A, five questions out of seven questions from Part B and three questions out of five questions 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

[10×2=20]

PART – A

(Answer should be given up to 25 words only)

All questions are compulsory

Q.1 Discuss the term –

(i) Linearity

(ii) Causality

Q.2 Discuss State Transition Matrix & its role.

Q.3 What is LTI system?

Q.4 Find the energy of the signal $e^{-2t}u(t)$.

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Q.5 What are the advantages of DFT in comparison of DTFT?

Q.6 Explain Sampling Theorem.

Q.7 Explain Signal Reconstruction.

Q.8 Discuss the term Aliasing.

Q.9 What is continuous time decaying exponential?

Q.10 State Parseval's theorem for continuous time periodic signal.

[5x

PART – B

(Analytical/Problem solving questions)

Attempt any five questions

Q.1 Explain the properties of Laplace transform in detail.

Q.2 Determine the Nyquist rate and Nyquist interval corresponding to each of following signals -

(i) $x(t) = 1 + \cos(2000\pi t) + \sin(400\pi t)$

(ii) $x(t) = \sin(4000\pi t)/\pi t$

(iii) $x(t) = \cos[(4000\pi t)/\pi t]^2$

(iv) $x(t) = \text{sinc}(50\pi t).\ \text{sinc}(100\pi t)$

Q.3 Find the Fourier series coefficients of following signals -

(i) $x(t) = 1 + \cos(2\pi t)$

(ii) $x(t) = \sin\left(10\pi t + \frac{\pi}{6}\right)$

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Q.4 Determine the following system is linear or not

$\frac{5\,dy(t)}{dt} + y(t) = 5x(t)$.

Q.5 Find the convolution of following signals .

$x(t) = e^{-2t}\,u(t)$; $h(t) = u\,(t+2)$

Q.6 Find the 4 point DFT of sequence:

$x(n) = \sin\left(\frac{n\pi}{6}\right)$

Q.7 Determine the Laplace transform, pole and zero locations and associated ROC for following functions:

(i) $u(t)$

(ii) $\delta(t-t_0)$

(iii) $\cos(\omega_0 t + b)\,u(t)$

(iv) $\sin(\omega_0 t + b)e^{-at}\,u(t)$; $a > 0$

PART – C

[3×10=30]

(Descriptive/Analytical/Problem Solving/Design Questions)

Attempt any three questions

Q.1 Find inverse z-transform of $\frac{1}{(Z-3)(Z-2)}$; where

(i) $|Z| < 2$

(ii) $2 \le |Z| < 3$

(iii) $|Z| > 3$

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Q.2 A system has transfer function H(s) as given below -

$$H(s)= \frac{S^2+5S+9}{(S+1)(S^2-2S+10)}$$

Determine response h(t) assuming that - (i) System is causal

(ii) System is stable.

Q.3 Describe all the properties of DFT in detail.

Q.4 For a continuous time signal:

$$x(t) = 2 + \cos\left(\frac{2\pi}{3}\right)t + 4\sin\left(\frac{5\pi t}{3}\right)$$

Determine fundamental frequency ω_0 and Fourier series coefficients a_K such that $x(t)= \sum_{K=-\infty}^{\infty} a_K.e^{jk\omega_0 t}$

Q.5 Compute $y[n] = x[n] * h[n]$, where $x[n] = \alpha^n u[n]$, $h[n] = \alpha^{-n} u[-n]$; $0 < \alpha < 1$.

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