4E1228

Roll No. _____ Total No of Pages: 3

4E1228

B. Tech. IV - Sem. (Main) Exam., May - 2019

PCC Electrical Engineering

4EE4 – 07 Signals & Systems

EE, EX

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 is signal? Define continuous time signal and discrete time signal.

Q.2 Differentiate between causal and non – causal systems?

Q.3 Give the relationship between unit impulse function, unit step function and unit ramp function.

Q.4 Discuss the following terms for LTI system –

(a) Invariability (b) Memory

Q.5 What are Dirichlet conditions?

Q.6 Give the relationship between Laplace Transform and Fourier Transform.

Q.7 What is the difference between linear and circular convolution?

Q.8 Discuss the significance of z – transform.

Q.9 Define the term sampling period and sampling rate.v

Q.10 What is Aliasing Phenomenon? How can aliasing be eliminated?

PART – B

(Analytical/Problem solving questions) **[5×8=40]**

Attempt any five questions

Q.1 The systems given below have input x(t) or x[n] and output y(t) or y[n] respectively. Determine whether each of them is stable, causal, linear and time – invariant –

(a) $y(t) = x(t^2)$ (b) $y[n] = 2x[n]u[n]$

Q.2 Find the convolution of the following signals –

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

Q.3 Obtain the trigonometric fourier series for the half wave rectified sine wave as shown in fig (a).

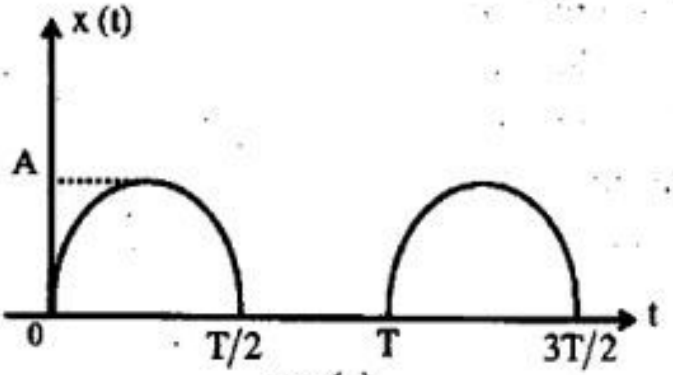

Fig (a)

Q.4 Prove the following properties of CTFT –

(a) Duality Property (b) Modulation Property

Q.5 State and prove the initial value and final value theorem for Laplace transform.

Q.6 Find the z – terms of the following discrete time signals –

(a) $x[n] = n\, a^n\, u[n]$ (b) $x[n] = u[n] - u[n - 3]$

Q.7 Determine the Nyquist rate and Nyquist interval corresponding to each of the following signals –

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

(b) $x(t) = \frac{\sin(4000\,\pi\, t)}{\pi t}$

(c) $x(t) = \left[\frac{\sin(4000\,\pi t)}{\pi t}\right]^2$

(d) $x(t) = \text{sinc}(50\pi t)\ \text{sinc}(100\,\pi t)$

PART – C

(Descriptive/Analytical/Problem Solving/Design Questions) **[4×15=60]**

Attempt any four questions

Q.1 Verify Parseval's theorem for the following discrete time sequence-

$$x[n] = \left(\frac{1}{2}\right)^n u[n]$$

Q.2 A system has transfer function H(s) as given below. Determine response h(t) assuming that –

(i) System is causal (ii) System is stable

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

Q.3 Find the inverse Z – transform of the following function using partial fraction expansion-

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

for the following ROC –

(a) $|z| > \frac{1}{2}$ (b) $|z| < \frac{1}{4}$ (c) $\frac{1}{4} < |z| < \frac{1}{2}$

Q.4 Describe all the properties of DFT in detail.

Q.5 State and prove the sampling theorem. Also explain interpolation with zero – order hold circuit.
