

3E1148

Roll No.

Total No of Pages: **3**

3E1148
B. Tech. III - Sem. (Main) Exam., Dec. 2022
PCC Electronics & Communication Engineering
3EC4 - 05 Signal & Systems
EC, EI

Time: 3 Hours

Maximum Marks: 120

Instructions to Candidates:

Attempt all ten questions from Part A, selecting five questions from Part B and four 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. Calculator2. NIL**20****PART - A****(Answer should be given up to 25 words only)****[10×2=20]****All questions are compulsory**

Q.1 Check whether the signal $x(n) = (-0.5)^n u(n)$ is energy signal, power signal or
neither. [2]

Q.2 Find period of signal $x(t) = \exp\left(j\left(\frac{\pi}{2}t - 1\right)\right)$ [2]

Q.3 The impulse response of discrete LTI system is given by $h(n) = \left(\frac{1}{2}\right)^n u(n)$. Let $y(n)$ be
the output of system with input $x(n) = 2\delta(n) + \delta(n-3)$. Find $y[1]$ and $y[4]$. [2]

(Where $u(n)$ is unit step signal and $\delta(n)$ is unit impulse signal)

- Q.4 $x(n) = n a^n u(n)$. Find its Z- transform. [2]
- Q.5 Find the nyquist rate of following signal [2]
- (a) $\text{sinc}^2(50t)$
- (b) $\sin(50\pi t) + \cos(100\pi t)$
- Q.6 $x(t) = e^{-3t} u(t)$. Plot the ROC (region of convergence) of $X(s)$ so that signal $x(t)$ is causal and stable. ($X(s)$ is Laplace transform of $x(t)$). [2]
- Q.7 The exponential fourier series coefficients of periodic impulse train $x(t) = \sum_{k=-\infty}^{\infty} \delta(t - kT_0)$ where T_0 is period of $x(t)$ [2]
- Q.8 If fourier transform of $x(t)$ is $X(\omega)$. What will be the fourier transform of $x(at)$? ($a > 0$) [2]
- Q.9 Find the Z- transform of $x(n) = \left(\frac{1}{2}\right)^n u(-n-1)$ [2]
- Q.10 Find the value of exponential fourier series coefficients of signal $x(t) = \cos(2\pi t)$ [2]

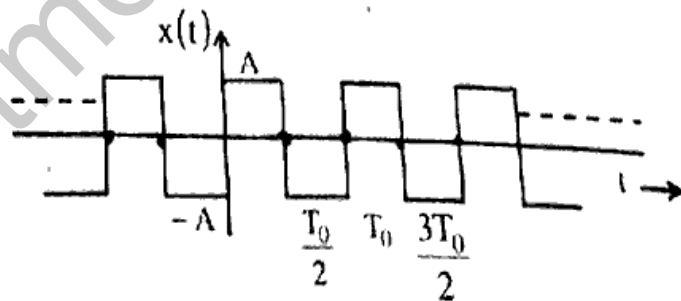
PART - B

(Analytical/Problem solving questions)

[5×8=40]

Attempt any five questions

- Q.1 Check for the causality, stability and memory-less property for following signals. [4]
- (a) $h(t) = e^{-at} u(t)$
- (b) $h(n) = u(n) - u(n-1)$ [4]
- Q.2 Define different properties of system with suitable example. [8]
- Q.3 Determine Fourier series coefficient of $x(t)$ given as- [8]



- Q.4 Explain properties of ROC of Z- transform. (ROC: Region of convergence) [8]
- Q.5 Find the inverse Laplace transform of $X(s) = \frac{2s+4}{s^2+4s+3}$ for given ROC $(-3 < \text{Re}(s) < -1)$ [8]

Q.6 Obtain the Fourier transform of-

(a) $\frac{1}{a^2+t^2}$ [4]

(b) $e^{-at} u(t)$ [4]

Q.7 Differentiate between real and flat top sampling. [8]

PART - C

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

Attempt any four questions

Q.1 If $x(t) = u(t) - u(t-3)$, $h(t) = u(t) - u(t-2)$ [15]

4 Find $y(t) = x(t) * h(t)$; here $*$ = convolution

Q.2 The response $y(t) = 2 e^{-3t} u(t)$ if input $x(t) = u(t)$ to a continuous time LTI system [15]

3 (a) Find impulse response of system

(b) Find output $y(t)$ if input is changed to $x(t) = e^{-t} u(t)$

Q.3 Find the inverse z -transform of following [15]

13 (a) $X(z) = \frac{z}{2z^2-3z+1}$ $|z| < \frac{1}{2}$

(b) $X(z) = \frac{z}{2z^2-3z+1}$ $|z| > 1$

Q.4 Explain properties of continuous time fourier transform (CTFT). [15]

Q.5 State the sampling theorem for low pass signals. Proof that there is loss of information due to aliasing or undersampling. [15]

[1700]