3E1148

Roll No.

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3E1148
B. Tech. III - Sem. (Main) Exam., Dec. - 2018
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. Calculator 2. NIL

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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)

[1700]

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) $sinc^2(50t)$

(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(w). What will be the fourier transform of x(at)? (a > o)

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

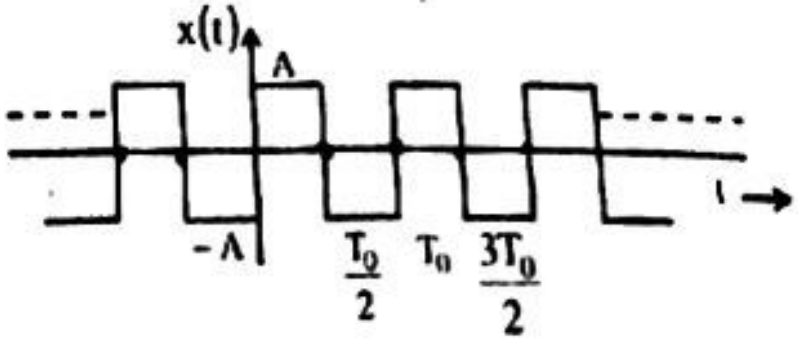
Q.1 Check for the causality, stability and memory-less property for following signals.

(a) $h(t) = e^{-at}\,u(t)$ [4]

(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 $(-3 < Re(s) < -1)$ [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]

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]

(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]

(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]