Code: 9A04304

R09

B.Tech II Year I Semester (R09) Supplementary Examinations June 2017

SIGNALS & SYSTEMS

(Common to EIE, E.Con.E, ECE & ECC)

Time: 3 hours | Max. Marks: 70

Answer any FIVE questions

All questions carry equal marks

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1 (a) Define the following elementary signals:
(i) Real exponential signal.
(ii) Continuous time version of a sinusoidal signal and Bring out the relation between Sinusoidal and complex exponential signals.
(b) Show that $\delta^{'}(-t) = -\delta^{'}(t)$.

2 (a) Derive an expression for complex Fourier Exponential series with the help of trigonometric Fourier series.
(b) Show that the Fourier series for a real valued signal can be written as:

$$x(t) = B(0) + \sum_{n=1}^{\alpha} B(n)Cos(nw_o t) + A(n)Sin(nw_o t)$$

Where B(n) and A(n) are real valued coefficients and express C_n in terms of B(n) and A(n).

3 (a) Find the Fourier transform of the periodic impulse train $\delta_{T_0} = \sum_{k=-\infty}^{\infty} \delta(t - kT_0)$.
(b) Find the Fourier transform of the signal, $x(t) = e^{-2t+1}u(\frac{t-4}{2})$.

4 (a) What is an LTI system? Explain its properties. Derive an expression for the transfer function of an LTI system.
(b) Explain the characteristics of an ideal LPF. Explain why it can't be realized.

5 (a) State & prove sampling theorem.
(b) A low pass signal x(t) has a spectrum X(f) given by $X(f) = 1 - \frac{|f|}{100}$ for $|f| \le 100$ and $X(f) = 0$, $|f| > 100$. Assume that x(t) is ideally sampled at f_S=150 Hz and then applied to a low pass reconstruction filter with cutoff frequency at 100Hz. Plot the spectrum of resulting signal.

6 (a) Find the cross-correlation of an arbitrary function and impulse function.
(b) Define auto-correlation and cross-correlation. Prove any two properties of correlation function.

7 (a) Find the inverse Laplace transform of $X(s) = \frac{5s+13}{s(s^2+4s+13)}, \mathrm{Re}(s) > 0.$
(b) Prove the convolution property of Laplace transform.

8 (a) Given $X(z) = \frac{z}{(z-1)^3}$, find x[n] using contour integration method.
(b) Distinguish between one-sided and two sided z-transforms. What are its applications?

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