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R09

B.Tech II Year I Semester (R09) Supplementary Examinations June 2016
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) The two periodic functions $f_1(t)$ and $f_2(t)$ with zero dc components have arbitrary waveforms with periods T and $\sqrt{2T}$ respectively. Show that the component in $f_1(t)$ of waveform $f_2(t)$ is zero in the interval $T_1 < t < T_2$.
   (b) State the properties of impulse function.

2 (a) Derive polar Fourier series from the exponential Fourier series representation and hence prove that $D_n = 2|C_n|$.
   (b) Show that the magnitude spectrum of every periodic function is symmetrical about the vertical axis passing through the origin.

3   Find the Fourier Transform of the following function:
   (a) A Single Symmetrical Triangular pulse.
   (b) A Single Symmetrical Gate Pulse.
   (c) A Single Cosine Wave at t=0.

4   The output y(t) of a causal LTI system is related to the input by the equation:

$$\frac{dy(t)}{dt} + 10y(t) = \int_{-w}^{w} x(\tau)z(t-\tau)d\tau - x(t) \text{ where } z(t) = e^{-t}u(t) + 3\delta(t).$$

   (a) Find the frequency response of this system H(w).
   (b) Determine the impulse response of this system.

5 (a) State sampling theorem for low pass signals and band pass signals.
   (b) What is aliasing effect? How it can be eliminated? Explain with neat diagram.

6 (a) Find the average autocorrelation function of the sinusoidal wave: $x(t) = ASin(wt + \gamma)$ where $w = \frac{2\pi}{T}$.
   (b) Determine the output of an LTI system whose input and unit sample response are given as follows: $x(n) = b^n u(n)$ and $h(n) = a^n u(n).$

7 (a) State and Explain ROC property of Laplace transform if x(t) is two sided.
   (b) Find the Laplace Transform of the signal $x(t) = e^{-|b|t}$.

8 (a) What are the methods by which inverse Z- transformation can be found out?
   (b) Given $X(z) = \dfrac{1}{(1 - az^{-1})}, |z| > |a|$. Find x [n] using long division method.

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