Code: 9A14601 **R09**

B.Tech III Year II Semester (R09) Supplementary Examinations December/January 2015/2016

SIGNAL PROCESSING TECHNIQUES

(Mechatronics)

Time: 3 hours Max. Marks: 70

Answer any FIVE questions
All questions carry equal marks
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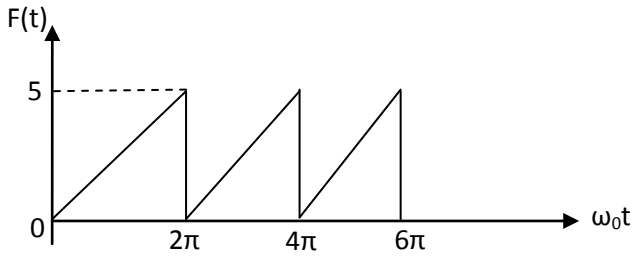
1 (a) Show that auto-correlation function and energy density spectrum form a Fourier transform pair.
(b) Find the cross correlation between triangular and gate function.

2 (a) Find the trigonometric Fourier series of the waveform shown below.



(b) Find the Fourier transform of $5sin^2 3(t)$.

3 (a) Discuss about classification of continuous signals and systems with examples.
(b) Differentiate digital signal processing with analog processing.

4 (a) State and prove sampling theorem.
(b) Discuss about: (i) Sample and hold circuit. (ii) Digital to analog converters.

5 Design a digital 11R low pass filter with pass band edge at 1000 Hz and stop band edge at 1500 Hz for a sampling frequency of 5000 Hz. The filter is to have a pass band ripple of 0.5 db and stop band ripple below 30dp. Design butter worth filter using both impulse invariant and bilinear transformations.

6 (a) Compare the performances of rectangular window, hamming window and Keiser window.
(b) The desired response of low pass filter is $H_d(e^{jw}) = \begin{cases} e^{-j3w} & -3\pi \le w \le {}^{3\pi}/_{4} \\ 0, & {}^{3\pi}/_{4} \le |w| \le \pi \end{cases}$
Determine $H(e^{jw})$ for M = 7 using a Hamming window.

7 (a) With reference to Z-transform, state the initial and final value theorem.
(b) Prove that a discrete LTI system is stable if and only if $\sum_{h=-\infty}^{\infty}|h(n)| < \infty$.

8 (a) Explain the structures for realization of FIR system and draw the direct form structure of the FIR system described by the transfer function
$H(z) = 1 + \frac{1}{2}z^{-1} + \frac{3}{4}z^{-2} + \frac{1}{4}z^{-3} + \frac{1}{2}z^{-4} + \frac{1}{8}z^{-5}$
(b) Explain the procedure for designing an FIR filter using Kaiser window..

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