Reg.No. _____

Karunya UNIVERSITY

(Karunya Institute of Technology & Sciences)
(Declared as Deemed-to-be University under Sec.3 of the UGC Act, 1956)

End Semester Examination – Nov/Dec – 2016

Semester : 2016-17 ODD
Code : 14EC3001 **Duration : 3hrs**
Sub. Name : Statistical Digital Signal Processing **Max. marks : 100**

ANSWER ALL QUESTIONS (5 x 20 = 100 Marks)

Q. No.	Sub Div.	Questions	Course Outcome	Marks
1.	a.	A random phase sinusoid is given by $x_n = A\sin(n\,\Omega_o + \phi)$. Where A is fixed amplitude and Ω_o is fixed angular frequency. The ϕ is random phase having a uniform PDF over the range -π to +π, $f(\phi) = \begin{cases} 1/2\pi & -\pi < \phi \le +\pi \\ 0 & otherwise \end{cases}$. Check whether the process is harmonic or not?	CO1	15
	b.	White noise with power spectral density, $P_{xx}(e^{jw}) = \sigma^2$ is passed through a filter with impulse response $h(n) = 0.5^n u(n)$. What is the output power spectral density?	CO1	5
		(OR)		
2.	a.	Show that the power spectrum of a WSS random process can be factorized as $P_x(z) = \sigma_0^2 H(z) H^*(1/z^*)$.	CO2	15
	b.	Define Periodogram. How DFT is used for its computation?	CO2	5
3.	a.	Compare Parametric and Non-Parametric methods of spectral estimation	CO2	5
	b.	Find the $j+1^{th}$ co-efficient of normal equation by developing Levinson- Durbin recursion algorithm.	CO3	10
	c.	Briefly Compare the performance measures for the Nonparametric methods of Spectrum Estimation.	CO2	5
		(OR)		
4.	a.	Explain in detail about Linear Mean Square Estimation and its usefulness in linear Prediction.	CO3	10
	b.	Explain in detail about the Autoregressive Spectrum Estimation with relevant diagrams.	CO2	10
5.	a.	Outline the procedure for design of a causal IIR Wiener filter that produces minimum mean square estimate of x(n).	CO3	20
		(OR)		
6.	a.	Explain in detail the steps involved in the development of discrete Kalman filter.	CO3	15
	b.	What is least mean squared error criterion? Explain.	CO1	5
7.	a.	Discuss adaptive noise cancellation using LMS algorithm.	CO3	12
	b.	Explain direct form FIR adaptive filter.	CO3	8
		(OR)		
8.	a.	With necessary equations and diagrams, discuss about the interpolation and decimation in multirate signal processing.	CO3	15
	b.	Define wavelet. List the applications of wavelet transform.	CO2	5

		Compulsory:		
9.	a.	Discuss in detail the steepest descent algorithmic steps and its limitations.	CO3	20

ALL THE BEST