CODE No.:16BT30402 SVEC-16

SREE VIDYANIKETHAN ENGINEERING COLLEGE

(An Autonomous Institution, Affiliated to JNTUA, Ananthapuramu)

II B.Tech II Semester (SVEC-16) Regular Examinations May - 2018

SIGNALS AND SYSTEMS

[Electronics and Instrumentation Engineering]

Time: 3 hours **Max. Marks: 70**

Answer One Question from each Unit
All questions carry equal marks

UNIT-I

1	a)	What are the basic operations on signals? Illustrate with an example.	CO1	6 Marks
	b)	Determine whether the following are energy or power signals? i) $x(t) = e^{-2t}u(t)$. ii) $x(t) = A\cos t$. iii) $r(t) = t\,u(t)$.	CO1	8 Marks
		(OR)		
2	a)	Define a system. How are systems classified? Define each one of them.	CO2	6 Marks
	b)	Find the linearity, invariance and causality of the following systems: i) $y(n) = -ax(n-1) + x(n)$. ii) $y(n) = x(n^2) + x(-n)$.	CO2	8 Marks

UNIT-II

3	a)	With regard to Fourier series representation, justify the following statements : i) Odd functions have only sine terms. ii) Even functions have no sine terms. iii) Function with half wave symmetry have only odd harmonics.	CO1	8 Marks
	b)	Prove that complex exponential functions are orthogonal functions.	CO1	6 Marks
		(OR)		
4	a)	State and prove the properties of Fourier transform.	CO1	6 Marks
	b)	Find the Fourier transform of following signals: i) $x(t) = e^{at}u(-t)$. ii) $x(t) = te^{-at}u(t)$. iii) $x(t)=\cos(\Omega_0 t)u(t)$.	CO4	8 Marks

UNIT-III

5	a)	The autocorrelation function of an a periodic power signal is $R(\tau) = e^{-\tau 2/2\sigma 2}$. Determine the PSD and the normalized average power content of the signal.	CO4	7 Marks
	b)	Determine the autocorrelation function and ESD of the following signal. $x(t) = e^{-at}u(t)$	CO1	7 Marks
		(OR)		
6	a)	State and prove time convolution theorem associated with Fourier transform.	CO1	7 Marks
	b)	Find the convolution of the two continous time signals $x(t) = e^{-\lvert t\rvert}$, for all t and $h(t) = e^{-2t}$ for $t \geq 1$ and 0 for $t < 1$.	CO1	7 Marks

UNIT-IV

7	a)	State and prove initial and final value theorems.	CO4	7 Marks
	b)	Find the inverse Laplace transform of $X(s) = 1/s(s+3)$ using integral property.	CO1	7 Marks
		(OR)		
8	a)	The input $x(t) = e^{-2t}u(t)$ is given to the system. The output response of the system to the input is $y(t) = e^{-t}u(t)$. Find the frequency response and impulse response of the system.	CO5	8 Marks
	b)	Write the properties of ROC for Laplace transforms.	CO1	6 Marks

UNIT-V

9	a)	State and prove sampling theorem for low pass signals.	CO3	7 Marks
	b)	A signal $x(t) = 2\cos 400\pi t + 6\cos \pi t$ is ideally sampled at $f_s = 500$Hz. If the sampled signal is passed through an ideal low-pass filter with a cut-off frequency of 400Hz, what frequency components will appear in the filter output?	CO5	7 Marks

(OR)

10	a)	State and prove integration and differentiation properties of Z-transform.	CO1	8 Marks
	b)	Using the appropriate properties, find the Z-transform of the signal. $x(n) = 2(3)^n u(-n)$	CO4	6 Marks