KADI SARVA VISHWAVIDHYALAYA

BE Semester V Examination November – 2016

Sub code: EE-506 **Sub Name: Signals and Systems**
Date: 22 /11/2016 **Total Marks: 70**
Time: 10:30am to 01:30pm

Instructions:

1. Answer Each Section in Separate Answer sheet.
2. Use of Scientific Calculator is permitted.
3. All questions are separate.
4. Indicate clearly, the options you attempted along with its respective question number.
5. Use the last page of supplementary for rough work.

SECTION I

Q.1 **(a)** Define Following Terms. **[05]**

(i) Continuous signal (ii) Discrete signal (iii) Periodic signal (iv) Even signal (v) Multichannel signal.

(b) List the basic operations, which are applied on discrete time signal and also explain two operations with example. **[05]**

(c) Determine whether the following systems are time invariant or not. **[05]**
(i) $y(n) = x(n) + nx(n-1)$ (ii) $y(n) = e^{x(n)}$.

OR

(c) Determine whether the following systems are linear or nonlinear. **[05]**
(i) $y(n) = nx^2(n)$ (ii) $y(n) = x(-n+2)$.

Q.2 **(a)** Explain the different methods of discrete time signal representation. **[05]**

(b) Obtain the linear convolution of two discrete time signals given as, **[05]**
$x(n) = \{\underset{\uparrow}{1}, 2, 3, 1\}$, $h(n) = \{1, \underset{\uparrow}{2}, 1, -1\}$

OR

Q.2 **(a)** State and explain the sampling theorem. **[05]**

(b) Obtain DTFT of unit step function u(n). **[05]**

Q-3 **(a)** List the properties of DTFT and prove any one property. **[05]**

(b) Determine sequence x(n) from its following DFT $X(K) = \{4,\ 1-j,\ -2, 1+j\}$ **[05]**

OR

Q-3 **(a)** Find the N- point DFT of x(n) if $x(n) = 1$; $0 \le n \le N-1$. **[05]**
$= 0$; otherwise.

(b) What is the condition for existence of Fourier transform, discuss it. **[05]**

SECTION II

Q.4 (a) Obtain the Fourier transform of single sided exponential pulse, $x(n) = \alpha^n u(n)$. [05]

(b) Comment on causal or non causal and stable or non stable system. [05]

(c) What is FFT ? Explain all advantages and applications of FFT. [05]

OR

(c) Draw the stage wise flow graph for radix 2 decimation in time FFT algorithm for N = 8. [05]

Q.5 (a) Define Z transform and discuss R.O.C with respect to Z transform. [05]

(b) Determine the Z transform and ROC of signal, $x(n) = [4(3^n) - 3(5^n)]u(n)$. [05]

OR

Q.5 (a) Prove the differentiation property of Z transform. [05]

(b) Obtain the inverse Z transform of , $X(Z) = \frac{\left[1-\frac{1}{2}Z^{-1}\right]}{\left[1-\frac{1}{4}Z^{-2}\right]}$. [05]

Q-6 (a) Determine the Z transform and ROC of finite duration signal, [05]

$x(n) = \{2, 4, 5, 7, 0, 1\}$

(b) Determine the Laplace transform of function $f(t) = \sin\omega t$. [05]

OR

Q-6 (a) State and prove initial value theorem for Laplace transform. [05]

(b) Find the inverse Laplace transformation of the function, $F(S) = \frac{S-1}{S^2+3S+2}$. [05]

KADI SARVA VISHWAVIDHYALAYA

BE 5th SEMESTER (EE)

End Semester Examination (May-2015)

Subject Code: EE-506 **Subject Name: -** SIGNALS AND SYSTEMS

Date: 25 / 04 /2015 **TIME:** 10:30 **to** 1:30 **TOTAL MARKS: 70**

Instructions:

1. Answer each section in good handwriting in separate answer sheet.
2. All questions are compulsory.
3. Use of scientific calculator is permitted.
4. **Indicate clearly the options you attempt, along with its respective question number.**

SECTION –I

Q-1 **[A]** Define the following: **[05]**
1. Signal **2.** Sampling **3.** Odd Signal **4.** Even Signal **5.** Period of a signal

[B] A continuous time sinusoidal signal $X_a(t) = COS^2\Omega_0 t$ is sampled at t = nT, $-\infty \leq n \leq \infty$, generating the discrete-time sequence X[n] = $X_a(nt) = COS^2(\Omega_0 nt)$. Find the value of T for which x[n] is periodic. What is the fundamental period of X[n] if $\Omega_0 = 9$ radian per second and T = $\pi/6$ seconds? **[05]**

[C] Differentiate between the following: **[05]**
1. Causal and Non-Causal system **2.** Static and Dynamic System

OR

[C] Explain the properties of LTI system. **[05]**

Q-2 **[A]** Determine whether the system is stable or not. **[05]**
(i) $h_1[n] = 0.3^n u[n-4]$ **(ii)** $h_2[t] = e^{-at}\cos bt\, u(t)$

[B] Determine the fundamental period of the following signal **[05]**
$x(n) = \cos 0.4\,\pi n$

OR

Q-2 **[A]** Show that the convolution of a length – M sequence with a length – N sequence leads to a sequence of length (M+N-1). **[05]**

[B] The input – output relation of some discrete-time systems are given below. Find whether the system is linear or not. **[05]**
(i) $y[n] = nx[n]$ **(ii)** $y[n] = x^2[n]$

Q-3 **[A]** Find the Laplace Transform of any **TWO** of the following: **[05]**
(i) $x(t) = e^{at}u(t)$ **(ii)** $x(t) = -e^{-at}u(-t)$ **(iii)** $x(t) = \sin(at)$

[B] Find the inverse Laplace Transform of the following: **[05]**

$$X(S) = \frac{4S}{S^2 + 2S + 5}$$

OR

Q-3 [A] Discuss any five properties of convolution. [05]

[B] What are Dirichlet's conditions? [05]

SECTION –II

Q-4 [A] State and prove sampling theorem [05]

[B] Compute the Fourier transform of the following signal: [05]
$x(n) = 2^n u(-n)$

[C] Explain Radix 2 FFT (decimation in time) algorithm. Obtain Butterfly structure for eight point decimation in time FFT algorithm. [05]

OR

[C] Find the Z- Transform and ROC of the following signal [05]
$x(n) = na^n u(n)$

Q-5 [A] Determine Fourier Series representation of a square wave signal. [05]

[B] Compute the Fourier transform of the following signal [05]
$x(n) = 2^n u(-n)$

OR

Q-5 [A] Explain the discrete time processing of continuous time signal. To achieve this give the block diagram of a system. [05]

[B] Determine the DTFT (Discrete Time Fourier Transform) of the following: [05]
$x[n] = 3(2^n)u[-n]$

Q-6 [A] Discuss FIVE properties of Z Transform. [05]

[B] Determine the Z-transform and plot the ROC of following: [05]
$x[n] = a^n u[n]$

OR

Q-6 [A] Find the Z transform of X[n] = (n+1) u[n]. [05]

[B] Find the inverse Z transform of $X(Z) = \log(1 - az^{-1})$, for $|Z| > |a|$ [05]

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-----Use your brains, Have patience, Think hard, write neatly and clearly-----

Best of Luck

KADI SARVA VISHWAVIDHYALAYA

BE 5th Semester Electrical Engineering Dept.

Examination –November 2015

Sub code: EE- 506 **Sub Name: Signal and Systems**

Date: 30 /11/2015 **Time: 10:30am to 01:30pm** **Total Marks:70**

Instructions:

1. Answer Each Section in Separate Answer sheet.
2. Use of Scientific Calculator is permitted.
3. All questions are separate
4. Indicate clearly, the options you attempted along with its respective question number.
5. Use the last page of supplementary for rough work.

SECTION I

Q.1 (a) Define a signal? Explain different types of signal. **[05]**

(b) Perform convolution of two discrete time signal mathematical method. **[05]**

$X(n) = (1/3)n \quad 0 <= n <= 6$ $\quad = 0$ others

$Y(n)=1 \quad -2<=,n<=2$ $\quad = 0 \quad$ others

(c) Explain the given systems with respect to following properties. **[05]**

(1) Time invariance (2) Linearity (3) Causality

$Y(n) = e^{X(n)}$

OR

(c) A discrete time signal is given by $X(n) = \{1,1,1,1,2\}$ **[05]**

Sketch the following signal

(1) X(n-3) (2) X(n+1) (3)X(3-n) (4) X(n-1)*u(n-1) (5) X(2n)

Q.2 (a) Determine Zero input response of system described by second order difference equation **[05]**

$Y(N)-5/6Y(N-1)+1/6Y(N-2)=0$

(b) Write down Properties of Discrete time Fourier series. Proof any one. **[05]**

OR

Q.2 (a) Write down Properties of continuous time Fourier series. Proof any one. **[05]**

(b) Solve second order difference equation **[05]**

$Y(n) -3/2y(n-1)+1/2y(n-2)= 1+3^{-n}\ n>=0$ with initial condition $y(-2) =0$ and $y(-1) =2$

Q-3 (a) Determine the Z transform $x(n) =e^{-at}\cos w_o t$. **[05]**

(b) Obtain the inverse Z Transform using PFE **[05]**

$$X(z)= \frac{3Z^2+2Z+1}{Z^2+4Z+3}$$

OR

Q-3 (a) Write down a Property of Z Transform. Proof any two Property. **[05]**

(b) Determine the Z transform $x(n) =0.8^n u(-n-1)$ and also draw the ROC. **[05]**

SECTION II

Q.4 (a) Define a Laplace Transform. And explain the relationship between Laplace Transform and Fourier Transform. **[05]**

(b) Find the Laplace Transform of the signal **[05]**
(1) $t^2u(t)$ (2) $tu(t)$

(c) Write Down Properties of Laplace Transform and Proof any Two. **[05]**

OR

(c) Find the inverse Laplace Transform using PFE **[05]**

$$H(s) = \frac{s-1}{(s+1)(s-2)}$$

Q.5 (a) Calculate 8 point DFT of X(n) = {1,2,1,2} **[05]**

(b) Explain the Relationship between DFT and Z Transform. **[05]**

OR

Q.5 (a) Compute N Point DFT of **[05]**
$X(n) = e^{-n}$ $0 <= n <= 4$

(b) Write Down Properties of DFT and Proof any One. **[05]**

Q-6 (a) Given the Two sequence of Length 4 are **[05]**
X(n) ={0,1,2,3} h(n) ={2,1,1,2}
Find the circular convolution and compare with Linear convolution.

(b) Explain Radix -2 Decimation In Time algorithm. **[05]**

OR

Q-6(a) Determine the circular convolution using matrix method. **[05]**
X(n) = {1,2,3,1} h(n) = {4,3,2,2}

(b) Find IDFT of X(k) ={1,2,3,4} **[05]**

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KADI SARVA VISHWAVIDYALAYA

B.E. SEMESTER V EXAMINATIONNOVEMBER 2014

SUBJECT CODE: **EE-506** SUBJECT NAME: **SIGNALS & SYSTEMS**

DATE:**24th November 2014** TIME: **10:30 am to 1:30 pm** TOTAL MARKS: **70**

Instructions:

1. Answer each section in separate Answer Sheet.
2. Use of scientific calculator is permitted.
3. All questions are compulsory.
4. Indicate clearly, the options you attempted along with its respective question number.
5. Use the last page of main supplementary for rough work.

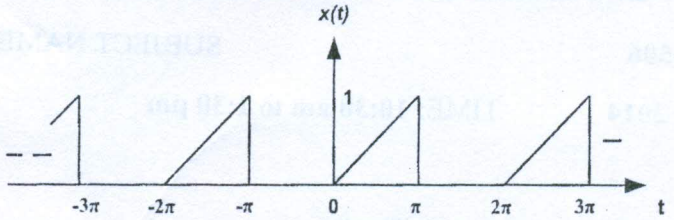
Section – I

Q-1:(A)	Distinguish between **(Any two)**: (i) Even and Odd Signal (ii) Static & Dynamic System (iii) Causal and Non Causal System	**05**
Q-1 (B)	Test whether following signals are energy signal or power signal. (a) $x[n] = (-0.5)^n\, u[n]$ (b) $x(t) = t^2\, u(t)$	**05**
Q-1 (C)	Sketch following signals, if $x[n] = \{1,2,-1,2,0.5,0.5\}$ (a) $x[4-n]$ (b) $x[n]\, u[2-n]$ (c) $x[n-1]\delta[n-3]$ (d) $x[\frac{n}{2}]$	**05**
	OR	
Q-1 (C)	Perform convolution of given signals $x(t) = \cos t\, u(t), 0 \le t \le 2$ and $h(t) = u(t), 1 < t < 2$.	**05**

Q-2(A)	Test whether the following systems are stable or not. **(Any two)** (a) $h_1[n] = 0.3^n u[n-4]$ (b) $h_2[n] = e^{-3\lvert n\rvert}$ (c) $h_3(t) = e^{-at}\cos bt\, u(t)$	**05**
Q-2(B)	Test whether the following systems are Linear and time-invariant or not. (a) $y(t) = e^{x(t)}$ (b) $y(t) = t^2 x(t)$	**05**
	OR	
Q-2(A)	Test periodicity of following signals. If yes, what is its fundamental period? **(Any two)** (a) $x(t) = \cos\frac{\pi}{3}t + \sin\frac{\pi}{4}t$ (b) $x[n] = \cos\left(\frac{\pi}{8}\right)n$ (c) $x(t) = \cos t + \sin\sqrt{2}\,t$	**05**
Q-2(B)	Perform convolution of two sequences with graphical method as well as cross table method and verify both. (a) $x[n] = \left\{\underset{\uparrow}{1}, 2,3,4\right\}; h[n] = \{\underset{\uparrow}{1}, 1,1\}$ (b) $x[n] = \left\{1, \underset{\uparrow}{-3}, 2, -3\right\}; h[n] = \{2, \underset{\uparrow}{-3}, 4\}$	**05**

Q-3(A)	Determine the Laplace transform of following and identify ROC, poles and zeroes located in the s-plane **(Any two)**: (a) $x(t) = e^{at}u(t)$ (b) $x(t) = e^{-2t}u(t) + e^{-4t}u(t)$ (c) $x(t) = -e^{-at}u(-t)$	**05**
Q-3(B)	Find the inverse Laplace transform of following: $$X(s) = \frac{s+2}{s^3 + 11s^2 + 34s + 24}$$	**05**
	OR	
Q-3(A)	Find the complete output response of the system *using Laplace transform* described by the differential equation $$\frac{d^2y(t)}{dt^2} + 6\frac{dy(t)}{dt} + 8y(t) = \frac{dx(t)}{dt} + 2x(t)$$ for unit step signal $x(t) = u(t)$. Assume initial conditions on systems are $y(0^+) = 1, \frac{dy(0^+)}{dt} = 2$	**05**
Q-3(B)	Find the system output $y(t)$ (w.r.t. Laplace transform convolution property) which is given by $y(t) = h(t) * x(t)$ if $x(t) = e^{-2t}u(t)$ and $h(t) = e^{-4t}u(t)$	**05**

Section – II

Q-4:(A)	Determine the Fourier series coefficients (exponential representation) of the signal $x(t)$ given below. 	**05**
Q-4 (B)	Determine the Fourier series representation (trigonometric form) of the half wave rectifier signal.	**05**
Q-4 (C)	Determine the Z-transform and plot ROC of following **(Any two)**: (a) $x[n] = a^n u[n]$ (b) $x[n] = a^n u[n] - b^n u[-n-1], b > a$ (c) $x[n] = -6^n u[-n-1] - 10^n u[-n-1]$	**05**
	OR	
Q-4 (C)	Explain Radix 2 FFT (Decimation in time) Algorithm. Obtain **Butterfly structure** for eight point decimation in time FFT algorithm	**05**

Q-5(A)	Determine the Fourier Transform of the triangular signal $x(t) = \begin{cases} A\left(1 - \frac{\lvert t \rvert}{T}\right), \lvert t \rvert < T \\ 0, otherwise \end{cases}$	**05**
Q-5(B)	Determine the Fourier Transform (using differential in frequency property) of the signal $x(t) = te^{-at}u(t)$	**05**
	OR	
Q-5(A)	Determine DTFT(Discrete Time Fourier Transform): (a) $x[n] = a^{-n}u[-n], \lvert a \rvert < 1$ (b) $x[n] = 3(2^n)u[-n]$	**05**
Q-5(B)	Determine the Inverse DTFT of $X(e^{j\omega}) = 2\sin 2\omega, -\pi < \omega < \pi$	**05**

Q-6(A)	Determine the 4-point DFT and Inverse DFT of the given signal $x[n] = \begin{cases} 1, & 0 \le n \le 3 \\ 0, elsewhere \end{cases}$	**05**
Q-6(B)	Find the circular convolution of given data sequences using circle method: (a) $x_1[n] = \{1,3,5,7\}$ and $x_2[n] = \{2,4,6,8\}$ (b) $x_1[n] = \{1,2,-3,4,-5\}$ and $x_2[n] = \{-2,4,6\}$	**05**
	OR	
Q-6(A)	Find the inverse Z-transform of following: (using long-division method) $X(Z) = \frac{1+Z^{-1}}{1-\frac{1}{5}Z^{-1}}$ when $\lvert Z \rvert > \frac{1}{5}$ and $\lvert Z \rvert < \frac{1}{5}$	**05**
Q-6(B)	Find the inverse Z-transform of following using convolution method $X(Z) = \frac{1}{1-\frac{1}{6}Z^{-1}-\frac{1}{3}Z^{-2}}$	**05**
	---Best of Luck---	