

End Semester Examinations - 2015-16 Even Semester - May 2016

14EC2003 Signals and Systems

Set B

Time : 3 hrs
Total Marks: 100

1. a. Determine whether the system described by the input output relation is static, linear, time invariant, causal. $y(t)=\cos(x(t))$ (10 marks)

- b. Sketch each of the following signals derived from unit step signal $u(t)$ (10 marks)

(i) $x_1(t)=u(t+2)$

(ii) $x_2(t)=u(t-2)$

(iii) $x_4(t)=u(-2t+1)$

(iv) $x_6(t)=x_1(t)-x_2(t)$

OR

2. a. Prove that $u[n] = \sum \delta[K]$, $-\infty \leq K \leq \infty$ (5 marks)

- b. Determine whether the system $y[n] = x[n+10] + x^2[n]$ is static, linear, time invariant, causal (15 marks)

3. a. An LTI system is characterized by its impulse response $h[n] = \{2,1,3,4\}$. Determine the response of the system to an input $x[n] = \{1,2,0,2\}$ graphically and verify the result using the matrix method (10 marks)

- b. Find the convolution of the following sequence (10 marks)

$$x(n)=2\delta(n+1)-\delta(n)+\delta(n-1)+3\delta(n-2)$$

$$h(n)=3\delta(n-1)+4\delta(n-2)+2\delta(n-3)$$

OR

4. a. Find the fourier transform for the following signal and sketch the frequency response $x(t)=e^{-a|t|}$ (10 marks)

- b. Find Inverse Fourier Transform for the following signal (10 marks)

$$X(j\omega)=j\omega/(3+j\omega)^2$$

5. a. Perform convolution of the following signals (10 marks)

$$x(t) = e^{-2t} u(t); h(t) = e^{-3t} u(t).$$

- b. Find the output of the system if $x(t)=e^{-at} u(t)$ and $h(t)=u(t)$ (10 marks)

OR

6. Consider a stable LTI system characterized by the differential equation (20 marks)

$$d^2y(t)/dt^2 + 6 dy(t)/dt + 8y(t) = 2x(t) \text{ Find}$$

- (a) impulse response of the system

- (b) What is the response of the system if $x(t)=te^{-2t}u(t)$

7. a. Find the laplace transform and ROC for the following signal (10 marks)

$$x(t)=e^{-b|t|}$$

- b. A signal has laplace transform of $X(s)=(s+2)/(s^2+4s+5)$. Find the Laplace Transform $Y(s)$ for the following signals using the properties. (10 marks)

(i) $y_1(t)=e^{-t}x(t)$

(ii) $y_2(t) = x(2t)$

OR

8. a.State and prove sampling theorem with relevant equations and diagrams. (15 marks)

- b. Find the nyquist rate for the given message signal (5 marks)

$$x(t)= \cos(200t) +\sin(400t)$$

9. a. Consider an LTI system for which the input $x(n)$ and output $y(n)$ satisfy the difference equation (15 marks)

$$y(n)-(1/2)y(n-1)=x(n)+(1/3) x(n-1)$$

Find the impulse response and frequency response of the system.

- b.Determine Z transform for the signal $x(n) = 7(1/3)^n u(n) - 6(1/2)^n u(n)$ and plot its RoC (5 marks)

Wishing you All the Best
