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SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR  
(AUTONOMOUS)

B.Tech II Year I Semester Supplementary Examinations December-2021

SIGNALS &amp; SYSTEMS

(Electronics and Communication Engineering)

Time: 3 hours

Max. Marks: 60

**PART-A**

(Answer all the Questions 5 x 2 = 10 Marks)

- 1 a Define a Signal. What is the relation between impulse, step, ramp, and parabolic signals? L1 2M
- b What are the Dirichlet's conditions? State them. L1 2M
- c What is anti-aliasing filter? L1 2M
- d State Parseval's energy theorem. L1 2M
- e State initial value theorem and final value theorem of Laplace transform. L1 2M

**PART-B**

(Answer all Five Units 5 x 10 = 50 Marks)

**UNIT-I**

- 2 a Find which of the signals are causal or non-causal. L2 5M  
(i)  $x(t) = e^{2t} u(t-1)$  (ii)  $x(t) = 3 \text{ sinc} 2t$  (iii)  $x(n) = u(n+4) - u(n-2)$  (iv)  $x(t) = u(-n)$
- b Find the even and odd components of the following signals L2 5M  
(i)  $x(t) = e^{j2t}$  (ii)  $x(t) = (1+t^2+t^3) \cos^2 10t$  (iii)  $x(n) = \{-3, 1, 2, -4, 2\}$  (iv)  $x(n) = \{5, 4, 3, 2, 1\}$

**OR**

- 3 a Check whether the following system is (i) static or dynamic (ii) linear or non-linear L4 5M  
(iii) causal or non-causal (iv) Time invariant or time variant  
 $d^3y(t)/dt^3 + 2d^2y(t)/dt^2 + 4 dy(t)/dt + 3y^2(t) = x(t+1)$
- b Determine whether the following signals are energy signals or power signals. L6 5M  
Calculate their energy or power.  
(i)  $x(t) = t$  (ii)  $\sin^2 \omega_0 t$  (iii)  $x(t) = e^{j[3t+(\pi/2)]}$  (iv)  $x(n) = (1/2)^n u(n)$

**UNIT-II**

- 4 a State and prove the properties of Continuous time Fourier transform. L2 5M
- b Find the Fourier transform of (i)  $\sin \omega_0 t$  (ii)  $\cos \omega_0 t$ . L4 5M

**OR**

- 5 a Find the Fourier Transform of the Signal (i) Triangular Pulse (ii)  $e^{-a|t|}$  L4 5M
- b Find the Fourier transform of the following signals L4 5M  
(i)  $x(t) = e^{-3t} u(t)$  (ii)  $x(t) = te^{-at} u(t)$  (iii)  $x(t) = e^{-t} \sin 5t u(t)$  (iv)  $x(t) = e^{-t} \cos 5t u(t)$

**UNIT-III**

- 6 a Derive the transfer function and impulse response of an LTI system. L6 5M  
 b Let the system function of an LTI system be  $1/(j\omega+2)$ . What is the output of the system for an input  $(0.8)^t u(t)$ . L4 5M

**OR**

- 7 a Find the Nyquist Rate and Nyquist Interval of the following signals. L4 6M  
 (i)  $x(t)=1+\cos 2000 \pi t + \sin 4000 \pi t$  (ii)  $x(t)=10 \sin 40\pi t \cos 300\pi t$   
 b A system produces an output of  $y(t)= e^{-3t} u(t)$  for an input of  $x(t)= e^{-5t} u(t)$ . L4 4M  
 Determine the impulse response and frequency response of the system.

**UNIT-IV**

- 8 a State and prove the time convolution theorem with Fourier transforms? L2 6M  
 b Verify Parseval's theorem for the energy signal  $x(t)=e^{-4t} u(t)$ . L3 4M

**OR**

- 9 a Derive the relation between convolution and correlation. L6 5M  
 b Find the autocorrelation of the signal  $x(t)= A \sin (\omega_0 t +\theta)$ . L4 5M

**UNIT-V**

- 10 a Find the Laplace transform of the signal  $x(t)= e^{-at} u(t) - e^{-bt} u(-t)$  and find its ROC. L4 5M  
 b Find the inverse Z-transform of  $X(z)$  given  $X(z) = 1/(1-az^{-1})$ , ROC;  $|z|>|a|$  L4 5M

**OR**

- 11 a State and prove initial and final value theorems of Z-transform. L2 5M  
 b Find the inverse z-transform of  $X(z)=3z^{-1} / (1-z^{-1})(1-2z^{-1})$  L4 5M  
 (a) If ROC;  $|z|>2$  (b) If ROC ;  $|z|<1$  (c) If ROC;  $1<|z|<2$

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