C 37073 (Pages : 2) Name.....

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE EXAMINATION, JUNE 2004

IT 2K 403. SIGNALS AND COMMUNICATION SYSTEMS

(New Scheme)

Time : Three Hours Maximum : 100 Marks

Answer **all** *questions.*

1. (a) Explain causality and stability of a system.
   (b) State and prove time-shifting property of continuous-time Fourier transform.
   (c) Find the spectrum of rectangular pulse of width τ and height A and plot it.
   (d) Find the discrete-time Fourier transform of $x(n) = a^n u(n)$, $0 < a < 1$ and plot it.
   (e) Explain the significance of pole-zero diagram in system analysis.
   (f) Determine z-transform of $x(n) = a^n \cos(w_0 n) u(n)$.
   (g) Explain briefly FM.
   (h) Explain the term demodulation and give the methods for FM demodulation.

(8 × 5 = 40 marks)

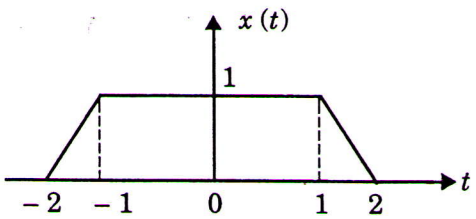
2. (a) (i) Define impulse response and explain its importance for LTI system. (7 marks)
   (ii) Find the response of LTI system with impulse response $h(t) = e^{-at} u(t), a > 0$, for the input $x(t) = u(t)$.

(8 marks)

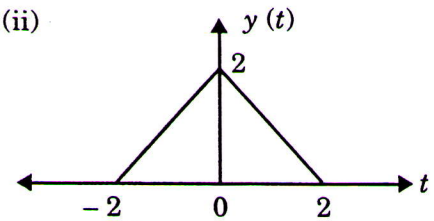
Or

(b) Find the Fourier transform of the following signal using differentiation property :—

(i)



(ii)



(15 marks)

3. (a) (i) Find the energy spectral density of the signal $x(t) = e^{-at} u(t), a > 0$. (7 marks)
   (ii) Derive the condition for distortion less transmission through an LTI system. (8 marks)

Or

(b) (i) Define Hilbert transform and find the complex analytical signal for the signal $x(t) = \cos(w_0 t)$.

(7 marks)

(ii) Derive the Parsavel's relation for discrete-time Fourier transform. (8 marks)

Turn over

4. (a) (i) Explain the method of obtaining frequency response from poles and zeros. (7 marks)

(ii) Find the transfer function and check whether the following system is stable :

$$\frac{d^3y(t)}{dt^3} + 4\frac{d^2y(t)}{dt^2} + 6\frac{dy(t)}{dt} + 4y(t) = 2\frac{dx(t)}{dt} + 2x(t).$$

(8 marks)

Or

(b) Find the impulse response of the system described by the following difference equation :—

$$y(n) = \frac{y}{12}y(n-1) - \frac{1}{12}y(n-2) + x(n-1) - \frac{1}{2}x(n-3).$$

(15 marks)

5. (a) (i) Explain angle modulation and derive expression for depth modulation. (8 marks)

(ii) Explain principle of frequency translation used in SSB generation. (7 marks)

Or

(b) (i) Explain any *one* method of generating FM signal. (11 marks)

(ii) Explain Carson's rule. (4 marks)

[4 × 15 = 60 marks]