C 31895 (Pages : 2) Name.....

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE EXAMINATION JUNE 2007

IT 2K 403—SIGNALS AND COMMUNICATION SYSTEMS

Time : Three Hours Maximum : 100 Marks

Answer **all** *questions.*

I. (a) Explain about :

(i) Stability ;

(ii) Causality ; and

(iii) Invertibility.

(b) Explain the Dirichlet's conditions for the existence of Fourier transform.

(c) Obtain the energy spectrum of a rectangular pulse of width 'τ' and amplitude 'A'.

(d) Find the discrete Fourier transform of $x(n) = \{1, 2, 3, 4\}$.

(e) What is meant by inverse system ? Explain.

(f) Find the z-transform and its ROC of

$$x(n) = n, \quad 0 \le n \le 3$$
$$= 6 - n, 4 \le n \le 6$$
$$= 0, \quad \text{otherwise.}$$

(g) Explain what is meant by (i) low level amplitude modulation ; and (ii) high level amplitude modulation.

(h) Explain the salient features of wideband FM system.

(8 × 5 = 40 marks)

II. (a) (i) Explain the following signals :—

(1) Power signal ; (2) Energy signal ; (3) Periodic signal ; (4) Deterministic signal ; and (5) Random signal.

(10 marks)

(ii) Explain with examples the operations on independent variable 't' of a signal $x(t)$.

(5 marks)

Or

(b) (i) Show that $x(t) * s(t - \tau) = x(t - \tau)$. (6 marks)

(ii) Find the Fourier transform of $x(t) = e^{-|t|}$. (9 marks)

Turn over

III. (a) (i) Show that output of an LTI system to the input $x(t) = e^{sub\, t}$, w_0-arbitrary constant is same replica of input.

(8 marks)

(ii) State and prove any *two* properties of discrete Fourier series representation. (7 marks)

Or

(b) A signal $x(t) = 2\cos(400\pi t) + 6\cos(640\pi t)$ is ideally sampled at the rate of 500 Hz. The sampled signal is passed through an ideal LPF with cut-off frequency $f_c = 400$ Hz. Find the output of the filter.

(15 marks)

IV. (a) For the given transfer function

$$H(s) = \frac{5s}{(s+1)(s^2+4s+8)}$$

draw the pole zero diagram and hence obtain the frequency response.

Or

(b) Find the impulse response of an LSI system described by the difference equation

$$y(n) = \frac{3}{4}y(n-1) - \frac{1}{8}y(n-2) + x(n).$$

(15 marks)

V. (a) Explain square law detector with neat circuit diagram and waveforms. (15 marks)

Or

(b) (i) Explain the relationship between phase modulation and frequency modulation. (8 marks)

(ii) Explain the varactor diode method for FM generation. (7 marks)

[4 × 15 = 60 marks]