D 51597 (Pages 3) Name.....

Reg. No.....

FIFTH SEMESTER B.TECH. (ENGINEERING) DEGREE EXAMINATION, DECEMBER 2008

EC/AI/IC/BM 04 501—SIGNALS AND SYSTEMS

(2004 admissions)

Time : Three Hours Maximum : 100 Marks

Part A

I. (a) Sketch the signals $x[n] = u[n] + u[n-2]$ and $x(t) = \delta(t) + \delta(t+1) - 2\delta(t-1)$.

(b) Check whether the following signals are periodic :

(i) $x(t) = e^{j\frac{3}{6}t}$.

(ii) $x[n] = e^{j\frac{5\pi}{3}n} + e^{j\frac{\pi}{8}n}$.

(c) State and prove the conjugation of continuous time Fourier series.

(d) For a periodic signal $x(n) = \left[1\ \underset{\uparrow}{1/2} - 1 - 1/2\right]$ with period N = 4, determine the Fourier coefficients a_k.

(e) State and explain Dirichlet's conditions.

(f) Express the forward and inverse Fourier transform. Explain the nature of them.

(g) For a combination of right-handed sequence and left-handed sequence, find the z-transform with ROC.

(h) State the BIBO stability theorem for an LTI system in z-domain.

(8 × 5 = 40 marks)

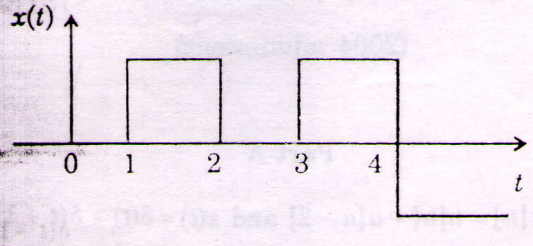
Part B

II. (a) (i) Explain the characteristics of continuous time and discrete time complex exponential functions.

(7 marks)

Turn over

(ii) For the given signal $x(t)$, sketch the signal $\frac{dx(t)}{dt}$.



(8 marks)

Or

(b) (i) Consider a discrete-time system with input $x[n]$ and output $y[n]$. The input-output relationship for this system is $y(n) = x[n]\, x\,[n-2]$. Check whether the system is memoryless and invertible. Also determine the output of the system when the input is $A\delta\ [n]$, where A is any real or complex number.

(7 marks)

(ii) Compute and plot the convolution :

$y[n] = x\,[n] * h[n]$, where

$x[n] = 1, \quad 3 \leq n \leq 8$

$= 0, \quad$ otherwise

$h[n] = 1, \quad 4 \leq n \leq 15$

$= 0, \quad$ otherwise.

(8 marks)

III. (a) Given that :

$x(t) = t, \quad 0 \leq t \leq 1$

$= 2 - t, \quad 1 \leq t \leq 2$

a periodic signal with fundamental period T = 2 and Fourier coefficients are :

(i) Determine the value of a_0.

(ii) Determine the Fourier series representation of $\frac{dx(t)}{dt}$.

(15 marks)

Or