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B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2007.

Third Semester

Electronics and Communication Engineering

EC 232 — SIGNALS AND SYSTEMS

(Common to Bio-Medical Engineering)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Draw the :
   (a) Impulse
   (b) Step function for continuous time signal $(\delta(t), u(t))$

2. Test whether the system $y(n) = \exp(x(n))$ is Linear or non-linear.

3. Find the Fourier transform of $\delta(t-2)$.

4. Find the S-domain *T-F*, if the poles are located at $p_1 = -1 + j; p_2 = -1 - j$ and a zero at $s = 0.5$.

5. Write the formula of convolution integral.

6. Find the final value $x(\infty)$, given that $x(s) = \dfrac{s+5}{s+3}$.

7. List any two properties of Z-transform.

8. Write DTFT pair.

9. Find the savings in No. of complex multiplication if Radix-2 FFT algorithm is used (N = 512).

10. Write the Transfer Function formula for Discrete time LTI system with *A, B, C, D* matrices.

PART B — (5 × 16 = 80 marks)

11. (a) Describe through examples, the classification of continuous time signals.

Or

(b) Given $x(n)$ and $y(n)$

$x(-1) = 2$

$x(n) = 1 \qquad 0 \le n \le 5$

$x(6) = 0.5$

$= 0$, for other 'n'

$y(n) = 2u(n)$

Plot : (i) $x\left(\frac{n}{2}\right)$

(ii) $x(n)\ y\left(\frac{n}{2}\right)$

(iii) Even part of $x(n)$

(iv) $x(n) + y\left(\frac{n}{2}\right)\delta(n-1)$

12. (a) Find the Fourier series for the square wave of Amplitude A. (Fig.1)

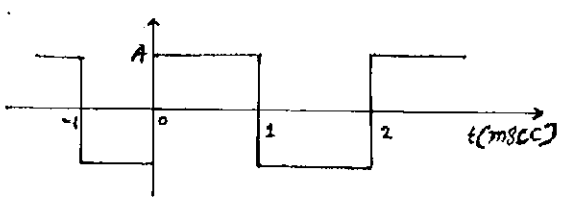

Fig. 1

Or

(b) (i) Find the Laplace transform of

(1) $e^{-at}u(t-1)$

(2) $\delta(t) + t^2 + u(t)$ (8)

(ii) Discuss the condition on stability of an LTI system based on Laplace domain representation. (3)

(iii) Bring the equivalence between Laplace transform and Fourier transform. (5)

13. (a) Consider the continuous-time LTI system initially at rest and described by the differential equation.

$\frac{d^2y(t)}{dt^2} + \frac{dy(t)}{dt} - 2y(t) = x(t)$ determine the step response.

Or

(b) If $x(t) = e^{2t}u(t)$ and $h(t) = e^{-4t}u(t)$ determine $y(t) = x(t) * h(t)$ by time domain method and frequency domain method.

14. (a) (i) Compute the DFT of $x(n)=\delta(n-2)$ and hence find $X(5)$. Assume $N=32$.

(ii) A program (software) is available for computing DFT. How will you use this program to find Inverse DFT.

Or

(b) (i) Find the Transfer function $H(z)$

$$y(n-2)+1.2y(n-1)+0.6y(n)=x(n)$$

(ii) Find the Inverse z-transform of $H(z)$:

$$H(z)=\frac{1}{(z-a)(z-b)},\ a>b.$$

15. (a) For the Digital structure determine the transfer function $Y(z)/X(z)$. (Fig.2)

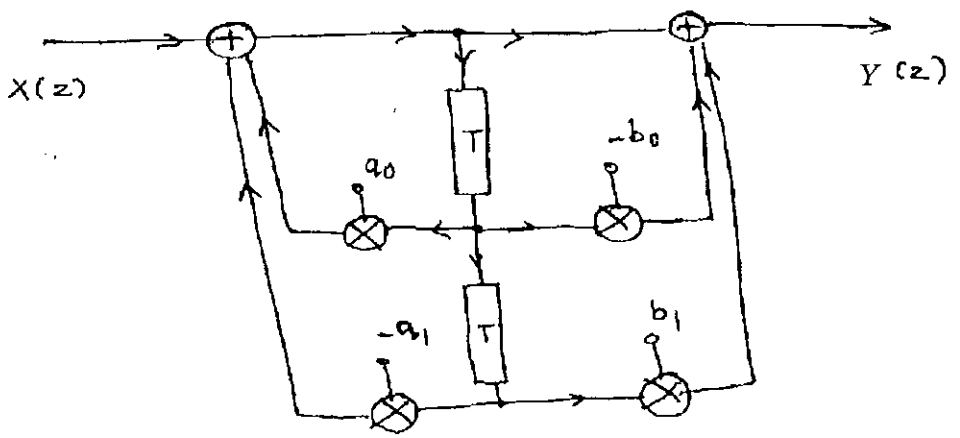

Fig.2

Or

(b) (i) Given that $y(n)+a\,y(n-1)=x(n)$, find the value of 'a' so that the system is stable.

(ii) Given that

$$A=\begin{bmatrix}0 & 1 & 0\\ 0 & 0 & 1\\ -6 & -16 & -8\end{bmatrix};\ B=\begin{bmatrix}0\\0\\1\end{bmatrix};\ C=[6 \quad 8 \quad 2]$$

$\dot{X}=AX+BU$

$Y_1=CX$ determine the S-domain transfer function.
