http://karthik3685.wordpress.com

D 030

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2003.

Third Semester

Electronics and Communication Engineering

EC 232 — SIGNALS AND SYSTEMS

Time : Three hours | Maximum : 100 marks

Answer ALL the questions.

PART A — (10 × 2 = 20 marks)

1. Define linear time invariant system.

2. What is the period T of the signal $x(t) = 2\cos\left(\frac{n}{4}\right)$?

3. What is the relationship between Fourier transform and Laplace Transform.

4. State modulation property and convolution (time) property of Fourier Transform.

5. Define impulse response of a linear time invariant system.

6. Write down the input–output relation of a LTI system in time and Frequency domain.

7. A signal $x(t)$, whose spectrum is shown in Fig. Q. 7 is sampled at a rate of 300 samples/sec. What is the spectrum of the sampled discrete time signal?

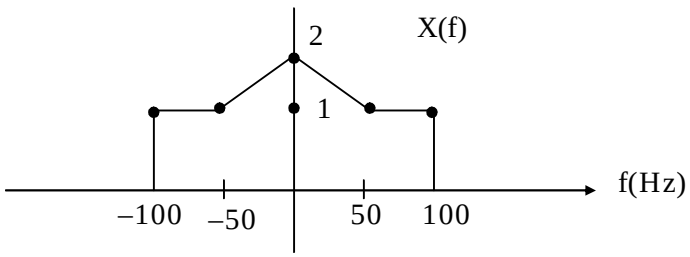


Fig. Q. 7

8. What is the relation between Z–transform and Fourier transform of discrete time signal?

9. Write the general difference equation relating input and output of a system.

10. Draw the state variable model for discrete system.

PART B — (5 × 16 = 80 marks)

11. What is the input $x(n)$ that will generate the output sequence

$$y(n) = \{1, 5, 10, 11, 8, 4, 1\} \text{ for a system with impulse response}$$
$$\uparrow$$
$$h(n) = \{1, 2, 1\}$$
$$\uparrow$$

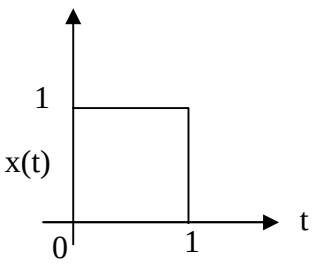
12. (a) (i) How do you represent any arbitrary signal in terms of delta function and its delayed function? (8)

(ii) Verify whether the following system is linear and time invariant system.

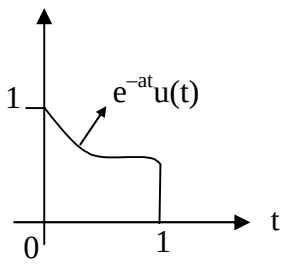
$y(n) = Ax(n) + B$ where A and B are constants. (8)

Or

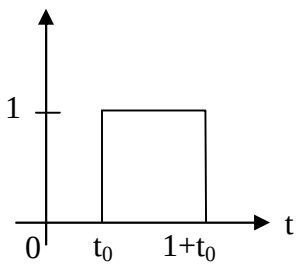
(b) (i) Assuming $x(t) \leftarrow \cdots \rightarrow X(w)$ for the signal shown in Fig. Q. 12 (a) find the Laplace transform of the signal shown in Fig. Q. 12 (b) to Fig. Q. 12 (d) in terms of $X(w)$. (9)



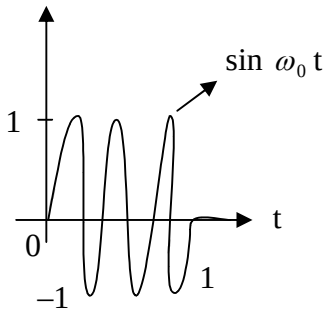
(a)



(b)



(c)



(d)

Fig. Q. 12

(ii) Prove that the spectrum of the product of two signals corresponds to the convolution of their respective spectrum. (7)

13. (a) (i) Find the inverse Laplace transform of

$$(2s^2 + 9s - 47)/(s+1)(s^2 + 6s + 25).$$ (6)

(ii) Find the Fourier series for the periodic signal $x(t) = t, 0 \le t \le 1$ and repeats every 1 sec. (10)

Or

(b) (i) Find the output of the system shown in Fig. Q 13 (b) for the input $\exp(-2t)\, u(t)$ using Laplace transform. (10)

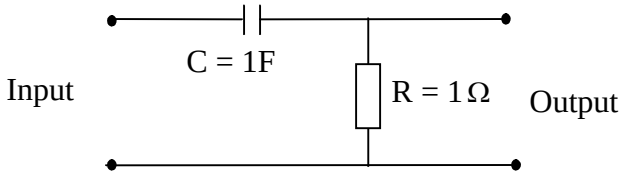


Fig. Q. 13 (b)

(ii) Find the inverse z transform of $x(z) = 1/(1 - 1.5z^{-1} + 0.5z^{-2})$ for ROC : $0.5 < z < 1$. (6)

14. (a) Find the impulse response of the stable system whose input–output relation is given by the equation

$$y(n) - 4y(n-1) + 3y(n-2) = x(n) + 2x(n-1).$$

Or

(b) (i) Find the discrete Fourier coefficients of $x(n) = (1, 2, 3, 4)$. (5)

(ii) Write down any 4 properties of z–transform and explain. (6)

(iii) Find the z transform of $\{u(n) - u(n-10)\}$. (5)

15. (a) Find the overall impulse response of the system shown in Fig. Q. 15 (a).

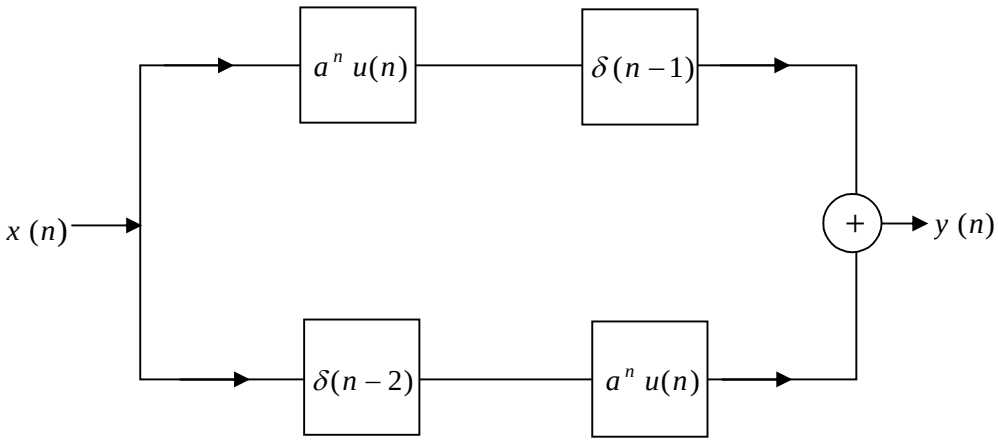


Fig. Q. 15 (a)

Or

(b) Find the state variable matrices A, B, C and D for the input–output relation given by the equation

$$y(n) = 6y(n-1) + 4y(n-2) + x(n) + 10x(n-1) + 12x(n-12).$$