Reg. No. :

Question Paper Code : 21354

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2013.

Third Semester

Electronics and Communication Engineering

EC 2204/EC 35/EC 1202 A/10144 EC 305/080290015 – SIGNALS AND SYSTEMS

(Regulation 2008/2010)

Time : Three hours | Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Check whether the discrete time signal Sin3n is periodic.

2. Define a random signal.

3. State the time scaling property of Laplace transform.

4. What is the fourier transform of a DC signal of amplitude 1?

5. Define the convolutional integral.

6. What is the condition for a LTI system to be stable?

7. What is the z transform of $\delta(n+k)$?

8. What is aliasing?

9. Is the discrete time system described by the difference equation $y(n) = x(-n)$ causal.

10. If $X(\omega)$ is the DTFT of $x(n)$, what is the DTFT of $x^*(-n)$?

PART B — (5 × 16 = 80 marks)

11. (a) (i) Define an energy and power signal. (4)

(ii) Determine whether the following signals are energy or power and calculate their energy or power.

(1) $x(n) = \left(\frac{1}{2}\right)^n u(n)$. (4)

(2) $x(t) = rect\left(\frac{t}{T_o}\right)$. (4)

(3) $x(t) = \cos^2(\omega_o t)$. (4)

Or

(b) (i) Define unit step, Ramp, Pulse, Impulse and exponential signals. Obtain the relationship between the unit step function and unit ramp function. (10)

(ii) Find the fundamental period T of the signal

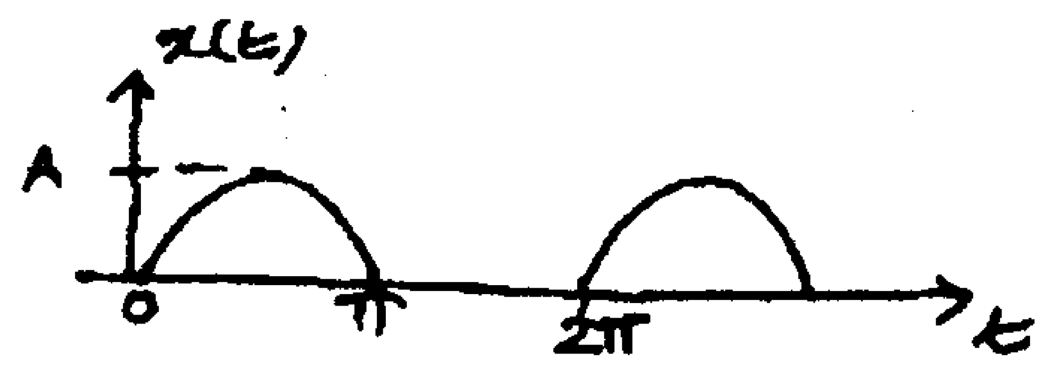
$x(n) = \cos(n\pi/2) - \sin(n\pi/8) + 3\cos(n\pi/4 + \pi/3)$. (6)

12. (a) (i) Compute the Laplace transform of $x(t) = e^{-b|t|}$ for the cases of $b < 0$ and $b > 0$. (10)

(ii) State and prove Parseval's theorem of Fourier transform. (6)

Or

(b) (i) Determine the Fourier series representation of the half wave rectifier output shown in figure below. (8)



(ii) Write the properties of ROC of laplace transform. (8)

13. (a) (i) Determine the impulse response $h(t)$ of the system given by the differential equation $\frac{d^2y(t)}{dt^2} + 3\frac{dy(t)}{dt} + 2y(t) = x(t)$

with all initial conditions to be zero. (8)

(ii) Obtain the direct form I realization of

$$\frac{d^2y(t)}{dt^2} + 5\frac{dy(t)}{dt} + 4y(t) = \frac{dx(t)}{dt}.$$ (8)

Or

(b) The system produces the output $y(t) = e^{-t}u(t)$ for an input $x(t) = e^{-2t}u(t)$.

Determine

(i) frequency response

(ii) magnitude and phase of the response

(iii) the impulse response. (16)

14. (a) (i) Determine the Z transform of $x(n) = a^n \cos(\omega_0 n)u(n)$. (8)

(ii) Determine the inverse Z transform of $X(z) = \frac{1}{1 - 1.5z^{-1} + 0.5z^{-2}}$ for $ROC|Z| > 1$. (8)

Or

(b) (i) State and prove the time shift and frequency shift property of DTFT. (8)

(ii) Determine the DTFT of $\left(\frac{1}{2}\right)^n u(n)$. Plot its spectrum. (8)

15. (a) (i) Obtain the impulse response of the system given by the difference equation $y(n) - \frac{5}{6}y(n-1) + \frac{1}{6}y(n-2) = x(n)$. (10)

(ii) Determine the range of values of the parameter "a" for which the LTI system with impulse response $h(n) = a^n u(n)$ is stable. (6)

Or

(b) Compute the response of the system $y(n) = 0.7y(n-1) - 0.12y(n-2) + x(n-1) + x(n-2)$ to the input $x(n) = n\,u(n)$. Is the System stable? (16)
