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Question Paper Code : 23443

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2018.

Third Semester

Electronics and Communication Engineering

EC 2204 — SIGNALS AND SYSTEMS

(Common to Biomedical Engineering)

(Regulations 2008)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Define discrete time unit step and unit impulse functions.
2. Define energy and power signals.
3. State Dirichlet's conditions.
4. Give the equation for trigonometric Fourier series.
5. List and draw the basic elements for the block diagram representation of the continuous time system.
6. Check the causality of the system with impulse response $h(t) = e^{-t}u(t)$.
7. Prove the time shifting property of discrete time Fourier transform.
8. State the final value theorem.
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) Find the even and odd components of the signal $x(n) = \{1, 0, -1, 2, 3\}$. (8)

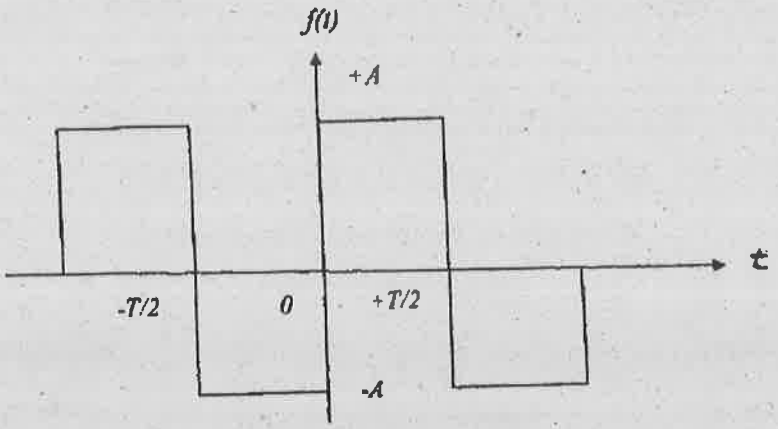
(ii) Find the fundamental period of the signal $x(t) = e^{j\frac{7\pi}{3}n}$. (8)

Or

(b) (i) Check the system $y(n) = \log_{10}|x(n)|$ is linear, time invariant, causal and static. (10)

(ii) Find the summation $\sum_{n=0}^{5} \delta(n+1)2^n$. (6)

12. (a) (i) Find the exponential Fourier series of the waveform. (10)



(ii) Find the Fourier transform of the signal $x(t) = e^{-a|t|}$. (6)

Or

(b) (i) Find the Laplace transform of the signal $f(t) = e^{-at} \sin \omega t$. (8)

(ii) Find the inverse Fourier transform of the rectangular spectrum given by $X(j\omega) = \begin{cases} 1, & -W < \omega < W \\ 0, & |\omega| > W. \end{cases}$ (8)

13. (a) Compute and plot the convolution $y(t)$ of the given signals

(i) $x(t) = u(t-3) - u(t-5)$, $h(t) = e^{-3t}u(t)$ (8)

(ii) $x(t) = u(t)$, $h(t) = e^{-t}u(t)$. (8)

Or

(b) The LTI system is characterized by impulse response function given by $H(s) = 1/(s+10)$ ROC : Re > -10.

Determine the output of a system when it is excited by the input

$x(t) = -2e^{-2t}u(-t) - 3e^{-t}u(t)$.

14. (a) (i) State and prove sampling theorem for low pass band limited signal and explain the process of reconstruction of the signal from its samples. (10)

(ii) State and prove any two properties of DTFT. (6)

Or

(b) (i) Find the z-transform of the sequence $x(n) = \cos(n\theta)\, u(n)$. (8)

(ii) Determine the inverse z-transform of the following expression using partial fraction expansion: (8)

$$X(z) = \frac{1}{\left(1 - \frac{1}{3}z^{-1}\right)\left(1 - \frac{1}{6}z^{-1}\right)}, \quad \text{ROC} : |z| > \frac{1}{3}.$$

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)
