Code: 13A04302 **R13**

B.Tech II Year I Semester (R13) Supplementary Examinations November/December 2016

SIGNALS & SYSTEMS

(Common to ECE and EIE)

Time: 3 hours Max. Marks: 70

PART – A

(Compulsory Question)

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1 Answer the following: (10 X 02 = 20 Marks)

(a) Derive any two properties of Impulse function.

(b) Determine whether the given signal f(t) = Rect(t/ τ) is energy or power & calculate the energy or power.

(c) Write Dirichlet conditions for Fourier Series.

(d) What is the relationship between Trigonometric and Exponential Fourier series?

(e) Find the Fourier transform of f(t) = f(t-2) + f(t+2).

(f) Derive Fourier transform of any general Periodic signal.

(g) Determine the Nyquist sampling interval of the signal f(t)= sinc(100πt) + 3 $sinc^2(60\pi t)$.

(h) Find the inverse Z-transform of X(Z) = $3Z^{-1}/[(1-Z^{-1})(1-2Z^{-1})]$ when ROC is $\{|Z|>2\}$ using the partial fraction method.

(i) Find the Laplace transform of $f(t)=t^2 e^{-3t} u(t)$.

(j) Define the Transfer Function and what its relation with Impulse response.

PART – B

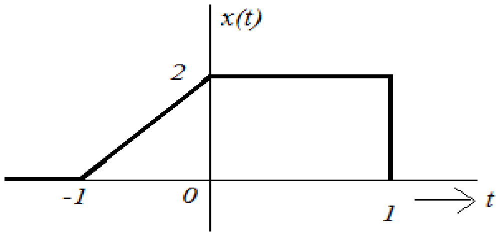
(Answer all five units, 5 X 10 = 50 Marks)

UNIT – I

2 (a) Find whether the signal f(t) = 10 Sin (12πt) + 2 u(t) is periodic or not? If periodic what is its fundamental period.

(b) Determine the response of the relaxed system characterized by the impulse response: $H(n) = (1/3)^n u(n)$ to the input signal $x(n) = 2^n u(n)$.

(c) Plot the Even and Odd components of a given signal x(t).

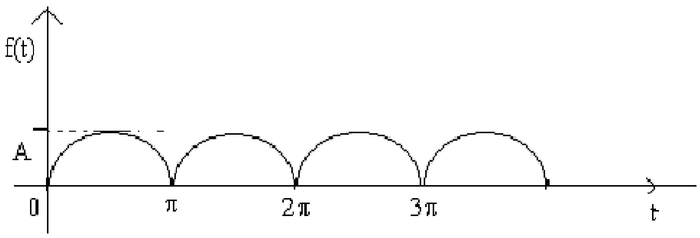


OR

3 Classify the systems based on the properties and explain each with an example.

UNIT – II

4 (a) Find the Exponential Fourier series expansion of the rectified Sine wave form shown below.



(b) Obtain the Fourier series representation of an impulse train given by: x(t) = δ(t − nT).

OR

5 (a) Determine the spectra of the signal x(n) = 3 cos0.4πn + 5 sin(π/2)n.

(b) Derive the power density spectrum of periodic signal.

Contd. in page 2

UNIT – III

6 (a) Find the Fourier transform of the function $x(t) = [u(t+2) – u(t-2)]\cos 2\pi t$ using frequency convolution property.

(b) Find the Fourier transform of the function $x(t) = t\, e^{-2t}\, u(t)$ using frequency differentiation property.

OR

7 (a) Find the Fourier transform of the function $x(n) = [1/2]^{|n-1}$.

(b) State and prove Parseval's theorem for discrete time Aperiodic signals.

UNIT – IV

8 Determine and sketch the magnitude and phase spectrum of $y(n) = ½\, [x(n)+x(n-2)]$.

OR

9 (a) State sampling Theorem for band-limited signals. What is Aliasing effect?

(b) The signal $x(t) = 10 \cos (10\pi t)$ is sampled at a rate 8 samples per second. Plot the amplitude spectrum for $|\Omega| \leq 30\pi$. Can the original signal can be recovered from samples.

UNIT – V

10 (a) Derive the relation between Laplace transform and Fourier transform of continuous time signal x(t)

(b) Use the convolution theorem of Laplace transform to find $y(t)= x_1(t) * x_2(t)$ where $x_1(t) = \cos(4t)\, u(t)$ and $x_2(t) = \sin(2t)\, u(t)$.

OR

11 Find the response of LTI discrete time system specified by the equation: $y(n)-(3/2)\, y(n-1)+(1/2)\, y(n-2) = 2x(n)+(3/2)\, x(n-1)$ if the initial conditions are $y(-1)=0$, $y(-2)=1$ and the input $x(n) = (1/4)^n\, u(n)$.

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