Code: 13A04302

R13

B.Tech II Year I Semester (R13) Supplementary Examinations June 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) Define the unit impulse and unit step functions with neat sketches.
(b) Define energy and power signals.
(c) Write a short note on Dirichlet conditions for Fourier series.
(d) State Parseval's theorem for Discrete Fourier Series.
(e) Find the Fourier transform of Unit step function.
(f) Find the Inverse Fourier transform of $\delta(f-2)$?
(g) Write a short note on Magnitude and Phase Representation of Fourier Transform.
(h) State sampling theorem.
(i) State Final Value theorem in Laplace Transform.
(j) State any two properties of the ROC of Z-Transform.

PART – B

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

UNIT – I

2 What is a LTI system? Determine whether the following systems are Linear and Time Invariant or not:

(i) $y(t) = \int_{-\infty}^{t} x(\tau)d\tau$.

(ii) y[n] = nx[n-1].

OR

3 (a) Define convolution. Find the convolution of two signals x[n] = u[n] and h[n] = $\alpha^n u[n]$ $0 < \alpha < 1$ and represent them graphically.

(b) Show that $x(t) * \delta(t - t_0) = x(t - t_0)$.

UNIT – II

4 (a) A train of rectangular pulses, making excursions from zero to one volt has a duration of 2μs and are separated by interval 10 μs. Assuming that the centre of one pulse is located at t = 0,obtain the trigonometric Fourier series of pulse train.

(b) Find the Fourier Series coefficient for signal x(t) = 2cos10t.

OR

5 (a) Determine the discrete Fourier series representation for the following sequences:

(i) $x[n] = \cos\left(\frac{\pi}{4}n\right)$.

(ii) $x[n] = cos^2\left(\frac{\pi}{8}n\right)$.

(b) Find the frequency response of discrete-time system described by the difference equation:

$y[n] - ay[n-1] = x[n]$

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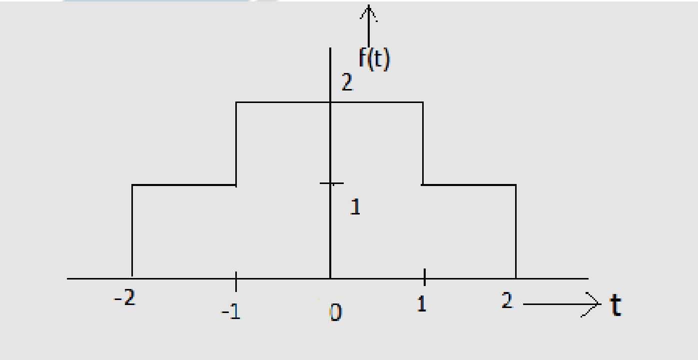
UNIT – III

6 (a) State and prove frequency shifting property of Fourier transform.

(b) Determine the Fourier transform of the signal shown in following figure below.



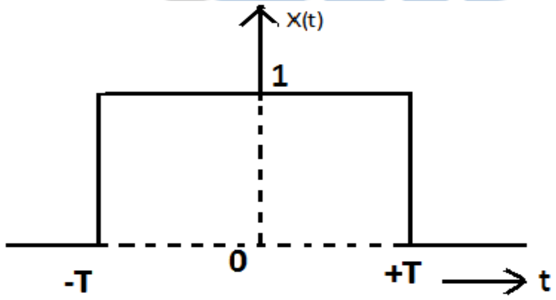
OR

7 (a) Define Discrete-Time Fourier Transform and write any four properties of DTFT.

(b) Determine the DTFT of signal $x[n] = \begin{cases} 1, & n=-1 \\ 2, & n=0 \\ -1, & n=1 \\ 1, & n=2 \\ o, & otherwise \end{cases}$

UNIT – IV

8 For the rectangular pulse shown in figure below, determine the Fourier Transform of x(t) and sketch the magnitude-phase representation with respect to frequency.



OR

9 (a) The signal g(t) = 10 cos(20πt) cos(200πt) is sampled at the rate of 250 samples per second. What is the Nyquist rate for g (t) as a low-pass signal and determine the lowest permissible sampling rate for this signal?

(b) What is Aliasing? Explain in detail with spectral details of a sample data.

UNIT – V

10 (a) Find the Laplace Transform X(S) and sketch the pole-zero plot with the ROC for the following signals x(t):

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

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

(b) Find the inverse Laplace Transform of X(S):

X(S) = $\frac{2S+4}{S^2+4S+3}$, -3<Re(s) <-1

OR

11 (a) Determine the response of the system: $y(n) = \frac{5}{6}y(n-1) - \frac{1}{6}y(n-2) + x(n)$ to the input signal x(n) = $\delta(n) - \frac{1}{3}\delta(n-1)$ with help of Z-Transform.

(b) Determine the inverse Z-Transform of X(Z) = ln(1 + az^{-1}); ROC |Z|>a.

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