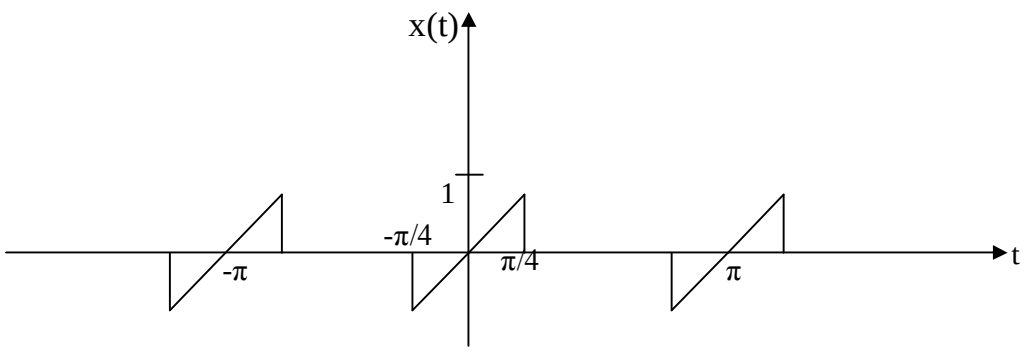
G.H. Raisoni College of Engineering and Management, Amravati
Department of Electronics and Telecommunication Engineering
Subject – Communication Engineering-I
Question Bank
Session – 2012-13

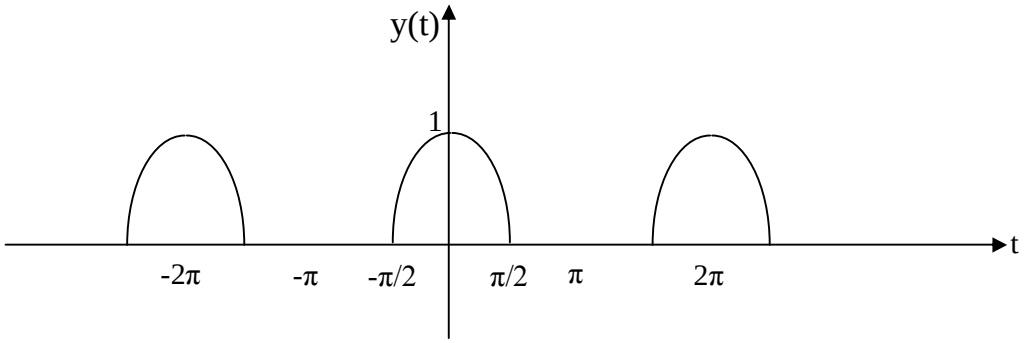
Question Bank Unit One: Signal and Noise

1. What is Signal? Explain the following types of signal –
   a.Continuous and Discrete Signal b. Analog and Digital Signal c. Deterministic and Non-deterministic Signal.
2. What is noise? Give examples. Explain the classification of noise in detail.
3. Show that noise figure, $F = 1 + R'_{eq}/ R_a$.
4. Define the equivalent noise temperature of a receiver or amplifier. Under what conditions could this be a more useful quantity than noise figure? Why?
5. If a mixer stage has a noise figure of 20 dB and this is preceded by an amplifier that has a noise figure of 9 dB and available power gain of 15 dB. Calculate overall noise figure.
6. The RF amplifier working at 10 MHz has a bandwidth of 200 KHz. The input resistance of stage one is 1kΩ with an equivalent noise resistance of 2kΩ. The receiver is connected to a 10μV, 75Ω source. Calculate –
   a. Equivalent noise voltage b. Noise figure of stage.
7. Two resistors 20kΩ and 50kΩ are at room temperature (290K). Calculate for a bandwidth of 100KHz, thermal noise for the following conditions-
   i. For each resistor ii. For two resistors in series and iii. For two resistors in parallel.

Question Bank Unit Two: Signal Analysis

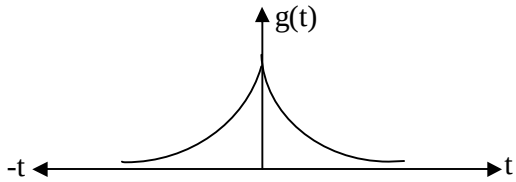
1. Find out the Fourier series coefficients for the following signals and sketch the amplitude and phase spectrum –



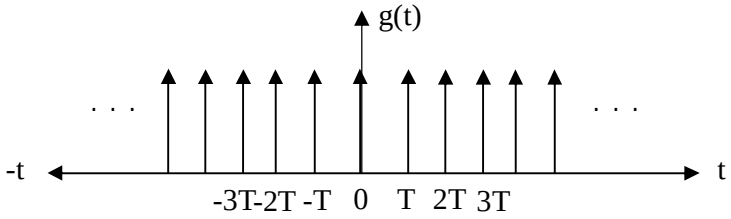


2. Find the Fourier transform of double sided exponential pulse as shown below –

   $g(t) = e^{-at}$; $t > 0$
   $= 1$; $t = 0$
   $= e^{at}$; $t < 0$.



3. State and prove convolution in time domain property of Fourier Transform.
4. Find the Fourier transform of $\sin(w_0 t)$. u(t) and sketch its spectrum.
5. Elaborate autocorrelation and find the autocorrelation function of $g(t) = e^{-at}$ u(t). What is the energy spectral density of g(t)?
6. Define energy spectral density and obtain an expression for it.
7. Find the Fourier transform of periodic function shown below –



Question Bank Unit Three: Probability and Random Signal Theory

1. Explain the following terms –
   a) Gaussian Process b) Ergodic Process c) Wide sense Stationary Process.
2. Explain the white noise. Draw the power spectral density and autocorrelation function for white noise.
3. Explain the Gaussian probability density function and give its significance.
4. Given that the probability density function is –

$$f_x(x) = \frac{1}{b-a}; \; a \le x \le b$$
$$= 0 \; ; \text{otherwise.}$$

   Find the mean and variance of random variable X defined by probability function $f_x(X)$.
5. The joint probability density function of two statistically independent random variables X and Y is given by –

$$f_{X,Y}(X,Y) = \frac{1}{4} \exp(-|x| - |y| \text{ for } -\infty < x, y < \infty$$

   Calculate the probability that $X \le 1$ and $Y \le 0$.

6. A random variable has PDF given by $f_x(X) = 2e^{-2x}$ for $x \geq 0$. Find the probability that it will take a value between 1 and 3.

Question Bank Unit Four: Wave Propagation

1. Explain ground wave propagation. What is angle of tilt? How does it affect field strength at a distance from transmitter?
2. Explain fading in detail.
3. Explain the terms –
   a) Virtual Height b) Skip Distance.
4. Explain the phenomena of ducting.
5. Explain the radio horizon. Calculate the maximum range for line of sight communication for which the heights of transmitting and receiving antennas are 100 meters and 60 meters.
6. Two points on earth are 1200 km apart and are to be communicated by HF. The critical frequency at the time is 7 MHz. Assuming that this is a hop transmission and conditions are idealized, calculate the maximum usable frequency for communication between these two points if the height of ionospheric layer is 300 km.
7. Explain the mechanism of refraction of sky waves through ionosphere.

Question Bank Unit Five: RF Transmission Line

1. Compare coaxial and parallel transmission lines.
2. Derive the expression for reflection coefficient at a load if a line with characteristics impedance Z_0 is terminated by load Z_L.
3. Explain the impedance inversion by a quarter wavelength line.
4. Explain the impedance matching by a single stub.
5. Using the smith chart, find the SWR on a 150 Ω line, when the line is terminated in a (225 – j75) Ω impedance. Find the nearest point to the load at which quarter wave transformer may be placed to match this load to line and calculate the characteristics impedance of transformer for matching of line to load.
6. Using smith chart, find the length and location of a stub to match load (225 – j75) Ω with a line of characteristics impedance 150 Ω.

Question Bank Unit Six: Antenna

1. Explain the log periodic antenna with heat diagram.
2. Describe Rhombic antenna. List its applications.
3. Describe Marconi or Grounded antenna. Discuss its radiation pattern. Give its advantages.
4. With neat sketch explain working of helical antenna. How does it differ from others?
5. Explain the difference between driven and parasitic elements in an antenna array. Hence describe the end fire array and its radiation pattern.
6. Explain the following terms related to antenna –

a) Directive gain
b) Directivity and power
c) Radiation resistance
d) Beam width
e) Bandwidth
f) Polarization
g) Antenna efficiency.

7. An antenna has a radiation resistance of 72 Ω, a loss resistance of 8 Ω and a power gain of 16. What efficiency and directivity does it have?