JAYPEEINSTITUTEOFINFORMATIONTECHNOLOGY

ElectronicsandCommunicationEngineering

Digital Systems (18B11EC213)

Tutorial Sheet:7

Q1. [CO5] Find the Nyquist rate of the following band limited signals:

a) sinc(100t)

b) $\text{sinc}^2(100t)$

c) $2\cos(200\pi t) + \sin(400\pi t)$

d) $\sin(100\pi t)\sin(200\pi t)$

Q2. [CO5] A Low pass signal has a Bandwidth= 3.4kHzis sampled at frequency f_s= 8kHz. Determine the Bandwidth of the guard Band.

Q3. [CO5] The band limited signals $x_1(t)$ and $x_2(t)$ has bandwidth 10 Hz and 20 Hz respectively. Find the Nyquist rate of the following signals.

a) $x_1(t)+x_2(t)$

b) $x_1(2t)$

c) $x_2(t+3)$

d) $x_1(t).x_2(t)$

e) $x_1(t)*x_2(t)$

Q4. [CO5] For an DSBFC wave with a peak unmodulated carrier voltage 8V peak a load resistance of R_L= 8Ω modulation index m = 1, Determine

a) Powerofthecarrier&thesidebands

b) Totalsidebandpower

c) Totalpower of themodulated wave.

d) Efficiency percentage

Q5. [CO5] A carrier with an un modulated power 80 W is modulated simultaneously by four modulating signals with coefficients of modulation m_{a1}=0.3, m_{a2}=0.4, m_{a3}=0.5, m_{a4}=0.6.

Find

a) Total coefficients of modulation

b) Sideband powers

c) Total transmitted power

d) Efficiency of transmission

Q6. [CO5] A message signal m(t)=2cos(200πt) + cos(600πt) DSBFC modulates the carrier signal c(t)=100cos(2000πt). The average power carried by the 1300 Hz sideband of the modulated signal will be ____ W.

Q7. [CO5] An audio signal described as 30 sin (2π*2500t) amplitude modulates a carrier which is described as 65 sin(2π*250,000t)

a) Sketch the audio signal.

b) Sketch the carrier.

c) Construct the AM (with carrier) modulated wave.

d) What is the modulation factor and percent modulation?

e) What is the frequency of the audio signal and of the carrier?

f) What frequencies would show up in a spectrum analysis of the modulated wave?

Q8. [CO5] An angle modulated signal has form u(t) = 100 cos[$2\pi f_c t$+ 4 sin2000πt], where *fc* = 10MHz

a) Determine the peak- phase deviation.

b) Determine the peak- frequency deviation.

c) Is this an FM or a PM signal? Explain.