1st Semester Regular Examination – 2016-17
Advanced Communication Techniques
Branch : M Tech
Time: 3 Hours
Max Marks: 100
Q Code :Y842
Answer Question No.1 which is compulsory and any four from the rest.
The figures in the right hand margin indicate marks.

Q1   Answer the following questions: (2 x 10)
- a) Write down two essential differences between QPSK and OQPSK.
- b) Write down the expression for a CPFSK signal. Show that part of the expression where the phase is continuous.
- c) Establish that QAM is a kind of memory less modulation scheme.
- d) Under what condition is a PLL linearized? What is the advantage of doing so?
- e) Write down the most generic expression for the received signal in a multichannel communication system.
- f) Does an AWGN channel represent a fading channel? Explain.
- g) Give the impulse response of an AWGN channel.
- h) What is minimum distance of a linear block code? What is its importance?
- i) What is a microwave oscillator? How does it work?
- j) Write down two essential functions performed by a waveguide.

Q2 a) Write down the expression for a raised cosine pulse. Hence evaluate its spectrum. Sketch the same with proper labels.   (2+6+2)

    b) Evaluate the average power contained in an M-ary QAM signal. Hence find out the average powers for 4 and 16 QAM.   (8+2)

Q3 a) An DSB-SC signal has a phase offset of $\Delta\phi$ at the ML receiver.   (5+5)
Evaluate the signal degradation in dB when the offset is 10^0 and 30^0. What inference do you draw from this?

    b) What is "Maximum Likelihood" estimation? Hence develop a suitable expression for the ML function of an M-ary modulated signal transmitted over AWGN when it has a parameter θ to be estimated.   (10)

Q4 (a) Derive the mean and the variance of a Rayleigh distributed random variable.   (10)

    (b) Derive the characteristic function and the CDF of a Rayleigh distributed random variable.   (10)

Q5 a) Suggest suitable a generator and a parity check matrix for the   (10)

Hamming (7,4) code. Hence give the minimum distance of this code.

b) Show that for a binary linear block code $GH^T = 0$ (10)

Q6 a) Determine the maximum throughput that can be achieved using ALOHA and slotted ALOHA protocols. (10)

b) A normal GSM time slot consists of six tailing bits, 8.25 guard bits, 26 training bits and two traffic bursts of 58 bits of data. Find the frame efficiency. (5)

Q7 a) Derive the expressions for the magnetic field and the associated electric fields of a Hertzian dipole. Assume a suitable magnetic vector potential and then evaluate the fields. (10)

b) Sketch the EM fields at radial distances away from an alternating time harmonic current carrying conductor and derive any field. (10)

Q8 a) The electric field of an electromagnetic wave propagating in a homogeneous medium is given by $\frac{50}{r}\cos(4\pi \times 10^6 t - 0.063r)\mathbf{a}_0 V/m$. Calculate the frequency, propagation constant, velocity and the magnetic field intensity of the wave if the relative permeability of the medium is equal to one. (10 x 2)

b) A certain coding scheme can correct t errors. The probability of error is p. Evaluate the probability that an $n-$bit codeword is in error. Assuming a small value for p, give an approximate expression for the probability of error.