Registration No: | | | | | | | | | | |

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M.TECH
ETPC101

1st Semester Regular/Back Examination – 2014
MODERN DIGITAL COMMUNICATION TECHNIQUES
BRANCH(S): COMMUNICATION ENGINEERING,COMMUNICATION SYSTEMS,ELECTRONICS & COMMUNICATIONS ENGINEERING,ELECTRONICS & TELE COMMUNICATION ENGINEERING

Time: 3 Hours
Max Marks: 70

Answer Question No.1 which is compulsory and any five from the rest.
The figures in the right hand margin indicate marks.

Q1 Answer the following questions: (2x10)

a) Write the Probability Mass Function (PMF) for the Bernoulli Random Variable.
b) Write any two properties of gamma function.
c) Write the equation for the mean and the variance of Nakagami Random Variable.
d) Write any two differences between multi channel and multi carrier system.
e) State the Central limit theorem.
f) Define white process and write any two properties of this process.
g) Define binary antipodal signaling.
h) Draw the Signal space diagrams for BPSK, QPSK and 8-PSK.
i) Why FSK signaling belongs to the class of nonlinear modulation schemes?
j) Write the need for symbol Synchronization in digital communication.

Q2 a) The PDF of a random variable X is p(x). (4)
A random variable Y is defined as Y =aX +b where a < 0. Determine the PDF of Y in terms of the PDF of X.

b) Assume that random processes $X(t)$ and $Y(t)$ are individually and jointly stationary. (6)
i. Determine the autocorrelation function of $Z(t) = X(t) + Y(t)$.
ii. Determine the autocorrelation function of $Z(t)$ when $X(t)$ and $Y(t)$ are uncorrelated.
iii. Determine the autocorrelation function of $Z(t)$ when $X(t)$ and $Y(t)$ are uncorrelated and have zero means.

Q3 What is Orthogonal Frequency Division Multiplexing (OFDM).Describe the modulation and demodulation techniques of OFDM system. (10)

Q4 a) Explain the power spectral density for linearly modulated signals. (5)
b) A speech s1gnal is sampled at a rate of 8 kHz, and then encoded using 8 bits per sample. The resulting binary data are then transmitted through an A WGN basebrnd channel via M-level PAM. Determine the bandwidth required for transmission when M =4 and M =8. (5)

Q5 a) Calculate the error probability for PSK signaling. (5)
b) Determine the ML phase estimate for offset QPSK. (5)

Q6 a) Calculate the capacity of a non ideal filter channel. (5)
b) Explain briefly about Direct Sequence Spread Spectrum (DSSS) Signals. (5)

Q7 a) Explain carrier recovery and symbol synchronization for M-ary PSK signal demodulation with proper block diagram. (5)
b) Explain 4-QAPSK with constellation diagram. Differentiate QAPSK and PSK. (5)

Q8 Write Short Notes (Any Two) (5 x 2)
a) The Ricean Random Variable
b) The Karhunen-Loeve Expansion
c) Binary PSK receiver
d) Phase- Locked Loop