National Institute of Technology, Hamirpur (HP)

Dy Ashore Kormer (174

Name of Examination: B. Tech. May 2023

Branch	:E&CE	Semester	:8 th
Course Name	: Spread Spectrum and CDMA	Course Code	: EC-440
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Maximum Marks :50

Note: 1) All questions are compulsory.

2) Assume suitable data where necessary, mention assumed data clearly.

Q.No.1.

Time: 3Hours

- I. Binary data is transmitted at the rate of R_b bits/sec over a channel occupying a bandwidth B and the channel SNR=3dB. If the data bit rate is increased to 2.65 R_b and the bandwidth is increased to 1.75B:
 - i. What would be the channel SNR for the new system?
 - ii. What channel bandwidth is required to keep the same channel signal-to-noise ratio? (5)
- II. Compute and draw the autocorrelation function for the sequence A= (-1, -1, -1, +1, -1, +1, +1). Assume the basic waveform is rectangular waveform defined by $f(t) = Rect (t/T_c - 1/2)$. (5)

Q.No.2.

- I. Calculate the mean acquisition time for serial search in CDMA for a general case where nth hypothesis is true hypothesis in N number of search cells and true hypothesis is achieved after j number of miss and k number of false alarms. (5)
- II. What do you understand by multipath Rayleigh fading? Derive an expression for the probability of error when CDMA signal is subjected to multipath Rayleigh fading channel. (5)

Q.No.3.

- I. Describe double mix module (DMD) direct frequency synthesizer. How DMD can be used to achieve double digit resolution? (5)
- II. Describe the procedure of generating mask to generate required phase shift for special register initial loading 100... 00 in case of MSRG. Compute MSRG mask for all possible phase shift for f(x) = 1+x+x³
 (5)

Q.No.4.

- I. Explain why Power Control groups are used in reverse traffic channel of CDMA? Explain power groups used for various data rate and show how these help in power saving? (5)
- II. Describe the block interleaver and Wash encoder orthogonal modulator used in reverse Access Channel of CDMA-one. (5)

Q.No.5.

For m-sequence generator shown in the figure Find out:

- I. One period of sequence generated by LFSR
- II. Verify the balance property, run length property and correlation property for the LFSR output.

(6)



b. Calculate the loading vector of an m-sequence generator if $f(x) = 1+x^3+x^5$ and g(x) = 1+x (4)