53 (EC 712) SSCM

2017

SPREAD SPECTRUM COMMUNICATION

Paper : EC 712

Full Marks : 100

Time : Three hours

The figures in the margin indicate full marks for the questions.

*Answer **any five** questions.*

1. *(a)* Show that the error probability for a PSK signal is given by

   $$Pe\big|_{PSK} = \frac{1}{2} erf_c\left(\sqrt{\frac{E_b}{\eta}}\right)$$ where the

   symbols have their usual meaning.

   15

   (b) Draw the signal constellation diagram for a BPSK signal. What are the antipodal signals ? Give examples.

   2+2+1

2. Find an expression for the maximum bit error probability in case of a pulse noise jamming. Hence show that the optimised pulse noise jammer causes a degradation of approximately $31 \cdot 5 dB$ relative to continuous jamming at a bit error probability of 10^{-5}.

15+5

3. (a) Calculate the power spectrum of the DSSS transmitted signal when BPSK is used for both the data modulation and the spreading code modulation. Assume that the spreading code is 100 times the data rate, and the period of the spreading code is infinite.

15

(b) What is the difference between DSSS modulation and a convention BPSK modulation ?

Hence discuss the advantages of using DSSS modulation. 3+2

4. (a) Suppose that BPSK is used for both the data and the spreading modulation and that the interference is a singletone having power 'J'. Also assume that the jammer places jamming tone directly in the centre of the modem's transmission bandwidth. Show that the magnitude of the jammer power passed by an IF filter with transfer function $H(f)$ is given by $J_0 = J \cdot (T_C/T)$; where the symbols have their usual significance. 16

(b) What is the role of an IF filter in the above question? 4

5. Consider a random PAM pulse train. Show that the PSD of such a random pulse train is given by

$$Sy(f) = \frac{|P(f)|^2}{Tb} \sum_{n=-\infty}^{\infty} Rn.exp\left(-j2\pi nf \cdot Tb\right)$$

where 'Tb' is the bit period and 'Rn' is the correlation of the random variables of the amplitude. 20

6. *(a)* Show that in case of a single channel system using binary phase modulation, the total power is given by the data power. 10

   (b) Discuss an 'early late-gate' synchronising circuit. 10

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