

CARLETON UNIVERSITY
Department of Systems and Computer Engineering

SYSC4700 Telecommunications Engineering Winter 2004/2005

Midterm exam

Closed book. Use of non-programmable, non-communicating calculators is permitted.

Instructions:

1. Write answers in the spaces provided on the question sheet. If necessary, use both sides of a page. Write legibly, and state any assumptions that you make. A blank page is provided after question 4.
2. There are 4 questions. Do any three. All questions carry equal weight. If more than three questions are attempted, only the first three attempted will be marked.
3. An Erlang B table is provided at the end.

Your Name: _____

Student Number: _____

Question (<u>DO ONLY 3</u>)	Mark	Maximum possible mark
1		12
2		12
3		12
4		12
Total		36

Question 1

(a) Describe the DS1 system, showing how it converts voice signals to digital signals and multiplexes 24 of them into a 1.544 Mb/s bit stream. In your answer, comment on the choice of sampling rate, quantizing method and bit rate.

(b) Describe how a 1.544 MB/s DS1 stream is carried within a 51.84 Mb/s SONET STS-1 signal.

Question 2

(a) Describe how the Erlang B formula for blocking probability is used in telecommunication system design problems. You should use an example in your answer. (You need not write down the formula).

(b) Suppose a pair gain system concentrates 1000 individual subscriber loops onto N DS1 signals to a central office. Each subscriber loop is assumed to have an average busy hour traffic intensity of 0.1 Erlangs, and the blocking probability is to be no more than 1%. Determine the minimum value of N .

Question 3

- (a) Explain what is meant by a slip, and how buffering reduces the frequency of occurrence of slips.
- (b) For a primary reference clock source, that has a clock accuracy of one part in 10^{11} , a two-frame buffer for DS1 signals experiences a slip about once every 74 days, on the average. Prove this statement by computing the slip rate.

Question 4

(a) Give three examples of successful telecommunications standards. For each, describe what it is, and why and in what sense it is successful.

(b) Briefly describe the value of telecommunications standards to **ONE** of the following: (1) telecom users; (2) telecom equipment manufacturers; (3) telecom service providers.

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