

2003 Paper 5 Question 3

Digital Communication I

- (a) Define the terms *capacity* and *latency* as applied to a communications channel. [4 marks]
- (b) How can variable latency cause problems? You may wish to consider
- (i) XON/XOFF flow control;
 - (ii) streaming media;
 - (iii) protocol timeouts. [6 marks]
- (c) Describe the operation of a simple ARQ protocol with a window of a single packet. [4 marks]
- (d) A simple ARQ scheme is used to provide reliable transport over a link where 80% of packets other than short acknowledgements experience a 1 ms delay, 10% experience a 10 ms delay, and 10% are lost. Acknowledgements always experience a 1 ms delay and are never lost. What would be the expected throughput in packets/sec if the timeout was
- (i) 10 ms?
 - (ii) 12 ms?

Assume that the transmitter always has information to send and that transmission time is negligible.

It may be helpful to note that

$$\sum_{i=0}^{\infty} i x^i = \frac{x}{(1-x)^2}$$

[6 marks]