2001 Paper 12 Question 3

Digital Communication I

Information is to be conveyed from A to B using automatic repeat request (ARQ), forward error correction (FEC), and lossless compression.

(a) Explain the terms *ARQ*, *FEC* and *lossless compression*.   [5 marks]

(b) If we consider each of these functions to be operating at different protocol layers, what would be the most sensible ordering of the layers, and why?

[5 marks]

(c) Suppose:

- The underlying bit channel has a capacity of B, a delay τ and error rate ϵ_0.

- The compression ratio is $C < 1$.

- The FEC has rate $R < 1$ and given an error rate ϵ_0 provides an error rate ϵ_1 (which is detected).

- The ARQ protocol has a window size of W.

At what rate can the information be conveyed? [Hint: Consider when retransmissions are made.] State any assumptions you make about the operation of the ARQ protocol.   [10 marks]