

## COMPUTER SCIENCE TRIPOS Part IB – 2026 – Paper 4

### 8 Cybersecurity (fms27)

As its CISO (Chief Information Security Officer), you are responsible for the security of Megacorp’s commercially sensitive data. A compromise of such data would cost £5,000,000 in terms of regulatory fines, reputational damage and lost business. Your security audit highlighted three attack vectors and offered the following estimates.

- (A) SQL Injection: Probability is 20% per year. Software mitigations, costing £55,000 initially and £15,000 per year thereafter for maintenance, would reduce this probability to 1% per year.
- (B) Phishing: Probability is 35% per year. Security awareness training, costing £20,000 per year, would reduce it to 5% per year.
- (C) XSS: Probability is 15% per year. Software mitigations, costing £45,000 initially and £20,000 per year thereafter for maintenance, would reduce it to 2% per year.

A breach via any of the three highlighted vectors, which are assumed to be independent of each other, will result in the full £5,000,000 loss.

[*Note:* The CEO might sometimes be wrong. In such cases, the job of a competent CISO is to educate and advise, on the basis of convincing reasoning. Exact numerical answers are required for full marks.]

- (a) Compute the expected cost to the business in the first year if all mitigations are deployed. [4 marks]
- (b) The CEO of Megacorp dislikes upfront expenses and is only inclined to implement at most two of the mitigations—preferably the cheaper ones. Compute the expected first-year cost to the business for each of the three pairs and prepare a well-justified recommendation for the CEO. [8 marks]
- (c) Based on Prospect Theory, you anticipate that the CEO might have objections to your recommendation in Part (b). List any objections you anticipate, based on Prospect Theory. Explain, using Prospect Theory, why the CEO might raise them. Explain how you will address the objections to convince the CEO of the superiority of your recommendation. [4 marks]
- (d) An insurance company is offering to cover the full £5,000,000 loss for an annual premium of £180,000. Explain to the CEO how this compares to the best of the previously considered solutions, both in the first year and in subsequent years, and recommend whether to accept or reject this offer. [4 marks]