Where an algorithm is asked for, you may write in any suitable pseudocode. Correct syntax for any computer language is not expected.

Answer both questions.

1) The European Union has decided to establish a Europe-wide lottery. To do this they will need to support hundreds of thousands of computer-based terminals from which people can buy tickets. They expect the majority of these terminals to be connected through fixed lines of different quality, with some based in mobile vans which tour outlying villages. They also wish to establish an online element, which they expect to grow rapidly over the next few years and which will, naturally, be accessible from all over the world. The income generated from ticket sales will be subject to taxes which vary on a national basis. Tickets come in three forms:

   • those based on a customer's own selection of numbers

   • those based on a random selection of numbers chosen by the company

   • those based on numbers, chosen by the company, which represent the least popular set of numbers at the point in time the ticket is sold (to maximise expected payoff).

   In order to place a credible bid, a lottery company must show that they are technically able to fulfil the broad requirements of accessibility, scalability, robustness, and security at a minimum. The EU have commissioned you to specify the requirements in more detail at all levels from the protocol level upwards. Further, to assist the companies bidding, you should provide an example of a technical submission that would satisfy the requirements you have identified.   [60]

2) *What is ethical is intimately related to what is deemed to be socially acceptable at any given point in time. However, social norms take time to establish and are dependent on culture. Currently, the Internet is developing so quickly that there is no time to establish social norms before new innovation occurs. Likewise, the Internet is a global, cross-cultural, entity in which unpleasant material and unethical behaviour can cross national boundaries with ease. As a consequence, the time has come to regulate the Internet to promote better standards of behaviour and, in particular, to protect the young from unwanted intrusion and unpleasant material.*

   Produce a reasoned argument either for or against this assertion.   [40]

[END OF PAPER]