

2004 Paper 2 Question 5

Probability

A manufacturing plant consists of three machines, A , B and C , which fabricate electronic components. Machine A is responsible for 20% of the components, machine B is responsible for 30%, and machine C is responsible for 50%.

The manufactured components are supposed to be identical but it is known that 3 in every 1000 made by machine A are faulty, 1 in every 125 made by machine B is faulty, and 1 in every 250 made by machine C is faulty.

- (a) An inspector selects a newly-manufactured component at random and does not know which machine fabricated it. What is the probability that it is faulty? [5 marks]
- (b) A faulty component is drawn at random from a pile of rejects. Use Bayes's Theorem to determine the probabilities that the faulty component was fabricated by machines A , B and C respectively. Express your answers as fractions. [9 marks]
- (c) Six faulty components are drawn at random from a pile of rejects. What is the probability that two were fabricated by machine A , two by machine B , and two by machine C ? Your answer should be written as an expression which may incorporate the values determined in part (b). [6 marks]