

PART II

Questions 15 to 23 carry a total of 30 marks.

Do not write
in this margin

Question 15

In any time interval of one second, the probability of occurrence of an event E is 0.0015. Occurrences of E are independent of each other. Over the course of an hour, what (approximately) is the probability that E will occur more than once? [4]

$$B(3600, 0.0015)$$

$$P(E > 1) = P(E \geq 2) = 1 - P(0) - P(1)$$

$$= 1 - 0.9985^{3600} - 3600 \times 0.0015 \times 0.9985^{3599}$$

$$= 0.9712$$

$$N(5.4, 5.386) = 0.9713$$

Question 16

Describe from your own experience a random process that could usefully be modelled as a Poisson process, including in your description a statement of the value of the rate λ . [3]

Question 17

State the mean and standard deviation of the exponential random variable with probability density function [2]

$$f(x) = 3e^{-3x}, \quad x \geq 0.$$

$$E(X) = 1/\lambda = 1/3$$

$$SD(X) = \sqrt{1/\lambda^2} = 1/3$$