

EE304 - Probability and Statistics

Assignment 1

Due by 12 noon on Monday, 18th October

Late Submission will be Penalised

Question 1

E , F and G are events with $P(E) = 0.65$, $P(F) = 0.4$, $P(G) = 0.6$, $P(E \cup F \cup G) = 1$. Further, $P(E \cap F) = 0.3$, $P(E \cap G) = 0.35$, $P(F \cap G) = 0.2$. Calculate:

- (i) $P(E \cup F)$;
- (ii) $P(F \cup G)$;
- (iii) $P(E \cap F \cap G)$;
- (iv) the conditional probability $P(E|F)$;
- (v) the conditional probability $P(E|F \cup G)$;
- (vi) the probability that *exactly one* of the events E , F , G occurs.

Question 2

A 6 sided die is unfair and the probability of each number i is proportional to i . (This means that the probability $P(X = i) = k \times i$ for some fixed number k .) If this die is rolled twice, what is the probability of:

- (i) getting a 1 on both rolls;
- (ii) the sum of the two outcomes being an even number;
- (iii) the second outcome being 5 given that the sum of the two outcomes is even;
- (iv) the sum of the outcomes being even given that the second outcome is 5.

Question 3

A box of 25 mobile phones contains 10 phones equipped with WiFi but without a camera, 9 phones equipped with a camera but without WiFi and 6 phones equipped with both. If 5 phones are chosen randomly (without replacement) from this box, what is the probability that:

- (i) None of the 5 phones has both WiFi and a camera?
- (ii) All 5 phones have a camera?
- (iii) At least one of the phones has WiFi?

- (iv) Exactly two phones have WiFi but no camera, and the other three phones have a camera?
- (v) At least 3 phones have both WiFi and a camera.

Question 4

A company manufacturing laptops installs one of three operating systems on each laptop produced. It is known from product testing that during an hour of web browsing the probability a laptop with system 1 installed will crash is 0.15, the probability of a laptop with operating system 2 crashing is 0.08 and the probability of a laptop with system 3 crashing is 0.1. Operating systems 1 and 3 are installed on the same number of laptops while system 2 is installed on twice as many laptops as system 1 (or system 3).

- (i) What is the probability that a randomly selected laptop crashes during an hour of web browsing?
- (ii) If a laptop selected at random crashed during an hour of browsing the web, what is the probability it has operating system 2 installed?
- (iii) If a laptop selected at random does not crash during an hour of web browsing what is the probability it has operating system 1 or operating system 2 installed?

Question 5

The circuit in the diagram below functions provided there is a path of functional devices from left to right. The probability of each device functioning is shown and the devices operate independently of each other. What is the probability that the circuit functions?

