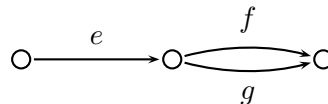


MAE113 DISCRETE TECHNIQUES FOR COMPUTING

**Coursework 10—to be handed in by noon, Wednesday 15/12/2010.**

*Write your name and student number at the top of your assignment before handing it in. You should attempt all questions because as little as one question might be marked.*

1. Consider families with four children and assume that it is equally probable that a boy or a girl is born. Let  $A$  be the event ‘there are children of both sexes’, and let  $B$  be the event ‘there is at most one boy’. Calculate:
  - (a)  $P(A)$
  - (b)  $P(B)$
  - (c)  $P(A \cap B)$ .
  - (d) Are the events  $A$  and  $B$  independent?
2. A fair coin is tossed three times. Calculate the probabilities of each of the following events:
  - (a) The first throw is heads.
  - (b) The outcome is HHT (i.e. heads the first two times and tails the third time).
  - (c) There are at least two Hs.
  - (d) There are Hs in two successive throws (i.e. in either the first two throws or the last two throws).
  - (e) Calculate whether or not the event (a) is independent of the event (d).
3. A coin is tossed three times. The coin is biased and the probability of heads is  $2/3$ . Calculate the probabilities of each of the events (a), (b), (c) in Q.2 for this coin.
4. We are given the following communication network



We write  $E$ ,  $F$ ,  $G$  for the events that edge  $e$  fails, that  $f$  fails and that  $g$  fails. The probabilities of  $E$ ,  $F$  and  $G$  are respectively 0.1, 0.2 and 0.3, and these three events are independent.

- (a) Fill in the probabilities in the following table:

	$E$	$F$	$G$	probability
1.	$T$	$T$	$T$	
2.	$T$	$T$	$F$	
3.	$T$	$F$	$T$	
4.	$T$	$F$	$F$	
5.	$F$	$T$	$T$	
6.	$F$	$T$	$F$	
7.	$F$	$F$	$T$	
8.	$F$	$F$	$F$	

- (b) Suppose we call a row of the table above good if it allows a message to get through the communication network. Which are the good rows?
- (c) What is the probability that a message will get through the network?