Indian Institute of Technology Bombay

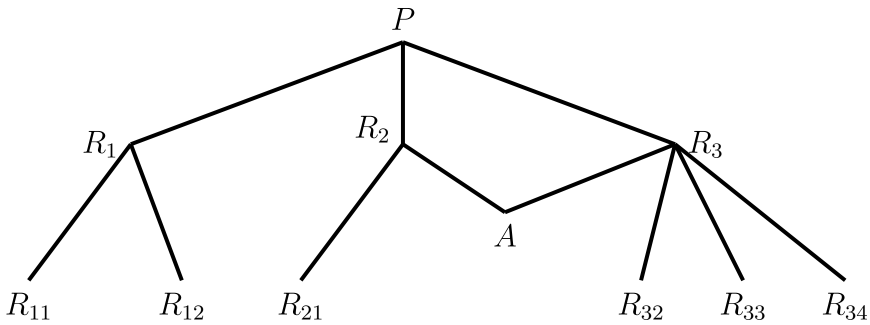
Department of Electrical Engineering

Handout 2 — EE 325 Probability and Random Processes

Tutorial 1 — January 18, 2019

Question 1) How many 14−letter words are there with the letters $EETHREEETWOFIVE$?

Question 2) (Rohatgi2001) Consider a bicyclist who leaves a point P (see Figure), choosing one of the roads PR1 , PR2 , PR3 at random. At each subsequent crossroad (or junction), she again chooses an available road at random.



(a) What is the probability that she will arrive at point A?

(b) What is the conditional probability that she arrived at A via road PR3 ?

Question 3) There were M boys M girls in the senior secondary graduating batch in a school. Suppose the school pairs each boy with a girl to do lab experiments. They graduated, many boys went to IITs, girls to Medical Schools etc. After 10years they re-assembled for the alumni meet at the school. M tables numbered $1, \cdots, M$, each with a pair of chairs, were arranged for the function. The ladies went first and each lady occupied a table. If the gents now walk in at a random order and occupy the first vacant seat, what is the probability that at least one of the table has an actual pair from the school days.

Question 4) For events $A_i, 1 \le i \le n$ show that

$$P(\bigcup_{i=1}^{n} A_i) = \sum_{j=1}^{n} (-1)^{j+1} \sum_{1 \le i_1 < \cdots < i_j \le n} P(A_{i_1}, \cdots, A_{i_j}).$$

Question 5) Ballot Problem: In an election, MAMA and RAHU polled a and b votes respectively, with $a > b$. Given this, what is the probability that MAMA always lead RAHU in the counting process?

Question 6) If a coin is tossed repeatedly (non-stop), what is the sample space Ω.

(a) Find the probability that the sequence HTH occurs before the sequence HHH.

(b) What is the probability of the sequence HHT occurring before THT.

Question 7) Suppose we have a set $C = \{A, B, C\}$. What do you think is the maximum possible number of elements in the sigma-field generated by C.

Question 8) Show that $\Pr\Big(\big(\bigcup_{i \in T} A_i\big) \cap B\Big) = \Pr\Big(\bigcup_{i \in T} \big(A_i \cap B\big)\Big)$