

# Practice Midterm

K. Subramani  
Department of Computer Science and Electrical Engineering,  
West Virginia University,  
Morgantown, WV  
ksmani@csee.wvu.edu

1.  $X$  is a discrete Uniform Random Variable, if the PMF of  $X$  has the following form:

$$\begin{aligned}\Pr(\mathbf{x}) &= \frac{1}{l - k + 1}, x = k, k + 1, \dots, l \\ &= 0, \textit{ otherwise}\end{aligned}$$

It is understood that the parameters of the distribution  $l$  and  $k$  are such that  $l > k$ . Argue that the above PMF describes a valid, probability distribution. Calculate the mean and standard deviation of this distribution?

2. Suppose you are given a coin that turns up Heads with probability  $p$ , when flipped, for some fixed  $p$ . Devise a scheme to generate unbiased coin flips, i.e. the probability of turning up Heads is  $\frac{1}{2}$ . (*Hint: You get to declare what Heads is!*)
3. Exercise (1.2) [MR95]
4. Exercise (2.1) [MR95]
5. Show that  $\mathbf{RP} \subseteq \mathbf{BPP}$
6. Exercise (3.3) [MR95]

## References

- [MR95] Rajeev Motwani and Prabhakar Raghavan. *Randomized Algorithms*. Cambridge University Press, Cambridge, England, June 1995.