SRM INSTITUTE OF SCIENCE & TECHNOLOGY	SRM Institute of Science and Technology Department of Mathematics 21MAB204T-Probability and Queueing Theory Unit – I Tutorial Sheet - 3

S.No.	Questions
1	A random variable X has mean 10 and variance 16. Find an upper bound for $P(\|X-10\|\geq 15)$
2	If X is a RV with $E(X) = 3$ and $E(X^2) = 13$, find the lower bound for $P(-2<X<8)$, using Tchebycheff's inequality.
3	If the Tchebycheff's inequality for a R. V X with SD 3 is $P(6 < X < 18) \geq \frac{3}{4}$, find the mean of X.
4	A discrete R.V X takes the values -a,0,a with probabilities $\frac{1}{8},\frac{3}{4},\frac{1}{8}$ respectively. Compute $P(\|X-\mu\| \geq 2\sigma)$ using Tchebycheff's inequality.
5	If X is a RV **uniformly distributed** in the interval (1, 2) find the Probability Density Function of $Y = e^X$
6	If X is a Random Variable with PDF $f_x(x) = \frac{2}{\pi}$, $0 < x < \frac{\pi}{2}$, find the PDF of $Y = \sin X$.
7	Given the RV X with Probability Density Function $f(x) = \begin{cases} 2x, & 0<x<1 \\ 0, & \text{elsewhere} \end{cases}$ find the PDF of (i) $Y = 8X^3$ (ii) $Y = 2X^2$ (iii) $Y = e^{-X}$ (iv) $Y = 4X-2$.
8	If X is a Random Variable **uniformly distributed** in the interval $\left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$, find the PDF of $Y = \tan X$.
9	If the RV X is **uniformly distributed** in the interval (-1,1), find the Probability Density Function (PDF) of (i) $Y = \sin(\pi X/2)$ (ii) $Y = \cos(\pi X/2)$
10	Let X be a continuous RV with PDF $f(x) = \begin{cases} \frac{1}{2}, & -1<x<1 \\ 0, & \text{otherwise} \end{cases}$ find the PDF of $Y = X^2$
	Part – B (Each question carries 8 marks)
11	An unbiased coin is tossed 100 times. Use Tchebycheff's inequality to find a lower bound for the probability of getting 30 to 70 fours.
12	A Random Variable X has PDF $f(x) = e^{-x}, x \geq 0$. Use Tchebycheff's inequality to find $P(\|X-1\|>1)$ and compare it with the actual probability.
13	Use Tchebycheff's inequality to prove that in 1000 throws with a coin the probability that the number of heads lies between 450 and 550 is at least $\frac{9}{10}$.
14	Using Tchebycheff's inequality, find how many times a fair coin must be tossed in order that the probability that the ratio of the number of heads to the number of tosses will lie between 0.4 and 0.6 will be at least 0.9
	Part – C (15 marks)

15	If X denotes the sum of the numbers obtained when two dice are thrown, obtain an upper bound for $P(\|X - 7\| \geq 3)$. Compare it with the exact probability.