SRM Institute of Science and Technology
Department of Mathematics
18MAB204T-Probability and Queueing Theory
Unit – I: Random Variables
Tutorial Sheet - 2

S.No	Questions	Answers
	Part – A	
1	State the Properties of MGF.	
2	If the r^{th} moment of a continuous RV X about the origin is r!, find the MGF of X	Ans: $M_x(t) = \frac{1}{1-t}$
3	Find the moment generating function of X whose moments are $E[X^r] = (r+1)!\,2^r$	**Ans:** $M_x(t) = \frac{1}{(1-2t)^2}$
4	If the pdf of a RV X is given by $f(x) = \begin{cases} \frac{1}{2}e^{-x/2}, & x > 0 \\ 0, & \text{elsewhere} \end{cases}$ find the moment generating function, mean and variance of X.	**Ans:** $M_x(t) = \frac{1}{1-2t}$ E[X]=2, V[X]=4
5	If the pdf of a RV X is $f(x) = ce^{-\|x\|}, -\infty < x < \infty$. Find the value of c and moment generating function of X.	**Ans:** $c=\frac{1}{2}$, $M_x(t) = \frac{1}{1-t}$
6	If the MGF of a RV X is $\frac{2}{2-t}$, find the SD of X.	**Ans:** $E[X]=\frac{1}{2}$, $V[X]=\frac{1}{4}$, $SD=\frac{1}{2}$
	Part – B	
7	Find the probability distribution of the total number of heads obtained in four tosses of a balanced coin. Hence obtain the MGF of X, mean and variance of X.	**Ans:** x: 0, 1, 2, 3, 4 p_x: $\frac{1}{16}$, $\frac{4}{16}$, $\frac{6}{16}$, $\frac{4}{16}$, $\frac{1}{16}$ $M_x(t) = \frac{1}{16}(1 + 4e^t + 6e^{2t} + 4e^{3t} + e^{4t})$ E[X]=2, V[X]=1
8	Find the MGF of the random variable X having the pdf $f(x) = \begin{cases} \frac{x}{4}e^{-x/2}, & x > 0 \\ 0, & \text{elsewhere} \end{cases}$ also deduce the first four moments about the origin.	**Ans:** $M_x(t) = \frac{1}{(1-2t)^2}$ $\mu_1' = 4$, $\mu_2' = 24$, $\mu_3' = 192$ $\mu_4' = 1920$
9	The first four moments of a distribution about X= 4 are1, 4, 10 and 45 respectively.Show that the mean is 5, variance is 3, $\mu_3 = 0$ and $\mu_4 = 26$.	
10	If the moments of a RV X are defined by $E[X^r] = 0.6; r = 1,2,3,...$ Show that P(X=0) = 0.4, P(X=1) = 0.6, P(X≥ 2)=0.	