1. List out any three discrete probability distribution with their parameters and probability mass functions which are useful in your respective engineering branch.

2. When three friends go for coffee, they decide who will pay the check by each flipping a coin and then letting the "odd person" pay. If all three flips produce the same result (so that there is no odd person), then they make a second round of flips, and they continue to do so until there is an odd person. Apply Geometric distribution for finding the probability that
(a) exactly 3 rounds of flips are made?
(b) more than 2 rounds are needed?

3. A batch of parts contains 200 from a local supplier of tubing and 300 from a supplier of tubing in the next state. Let X be the number of parts in the sample from the local supplier. Then X has a hypergeometric distribution. If three parts are selected randomly and without replacement then find
(a) the probability they are all from the local supplier
(b) the probability that two or more parts in the sample are from the local suppliers

4. The total duration of baseball games in the major league in the 2011 season is uniformly distributed between 447 hours and 521 hours inclusive.
(a)What is the probability that the duration of games for a team for the 2011 season is between 480 and 500 hours?
(b) What is the 50^{th} percentile for the duration of games for a team for the 2011 season?

5. The number of days ahead travellers purchase their rail tickets can be modelled by an exponential distribution with the average amount of time equal to 30 days. Find the probability that a traveller will purchase a ticket fewer than ten days in advance. How many days do half of all travellers wait?

6. An article in Mathematical Biosciences ["Influence of Delayed Viral Production on Viral Dynamics in HIV-1 Infected Patients" (1998, Vol.152(2), pp. 143–163)] considered the time delay between the initial infection by immunodeficiency virus type 1 (HIV-1) and the formation of productively infected cells. In the simulation model, the time delay is approximated by a gamma distribution with parameters: shape parament = 3 and rate parameter = 0.25 days. Determine the following:

(a) Mean and variance of time delay,
(b) Probability that a time delay is more than half a day.

7. Assume that the life of a packed magnetic disk exposed to corrosive gases has a Weibull distribution with parament $\beta = 0.5$ and $\delta = 500$ hours.

(a) Mean and variance of life of packed magnetic disk
(b) Probability that the packed magnetic disk fails before 250 hours

8. Suppose that income from occupation of a child, as an adult, depends upon the income from the occupation of his or her parents given by the following transition matrix, where L= low income, M= middle income, U= High income.

$$P = \begin{array}{c} \\ L \\ M \\ H \end{array} \begin{array}{c} \begin{array}{ccc} L & M & H \end{array} \\ \begin{bmatrix} 0.3 & 0.5 & 0.2 \\ 0.1 & 0.6 & 0.3 \\ 0.1 & 0.2 & 0.7 \end{bmatrix} \end{array}$$

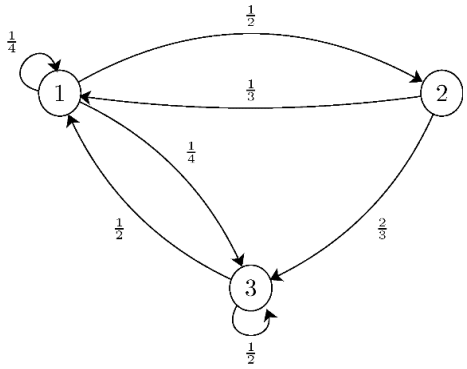
Find the probability that a person who is in low income in the current state will be in high income state in the next two years?

9. Consider an example of the internet with only 4 webpages A, B, C and D. In this example webpage A has links to pages C and B, page C had a link to page A, B, and D, page B had link to page D, and page D had link to page B. The transition matrix for the said Markov Chain is

	A	B	C	D
A	0	1/3	2/3	0
B	0	1	0	
C	1/4	1/2	0	1/4
D	0	0	0	1

Is it reducible or irreducible Markov Chain? List out the transient or recurrent classes?

10. Consider the Markov chain as shown in the following figure



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