# GODAWARI COLLEGE

**5TH SEMESTER, SIMULATION & MODELING**

**LAB & ASSIGNMENTS**

**Lab 3:**

***Question 1:*** Suppose you are designing a new web browser and you want to optimize the way it handles requests for new web pages. You decide to use a Markov chain to model the process of requesting and loading web pages.

The possible states of the Markov chain are "idle", "requesting", and "loading". At any given time, the browser is either idle (not requesting any new pages), requesting a new page, or loading a page that has already been requested. The transitions between these states are governed by the following rules:

If the browser is idle, it has a 50% chance of transitioning to the "requesting" state and a 50% chance of staying idle.

If the browser is requesting a page, it has a 75% chance of transitioning to the "loading" state and a 25% chance of returning to the "idle" state.

If the browser is loading a page, it has a 100% chance of transitioning back to the "idle" state once the page has finished loading.

Given this information, if the browser is currently idle, use the Markov chain to calculate the probability that it will remain idle, request a new page, or begin loading a page on the next time step.

***Question 2 :*** Suppose you are designing a new ride-sharing app and you want to optimize the way it matches drivers with riders. You decide to use a Markov chain to model the process of matching drivers and riders.

The possible states of the Markov chain are "idle", "waiting", and "matched". At any given time, a driver is either idle (not currently carrying a rider), waiting for a rider to request a ride, or matched with a rider (driving to the rider's destination). The transitions between these states are governed by the following rules:

If the driver is idle, it has a 20% chance of transitioning to the "waiting" state and a 80% chance of staying idle.

If the driver is waiting for a ride request, it has a 60% chance of transitioning to the "matched" state (if a rider requests a ride) and a 40% chance of returning to the "idle" state.

If the driver is matched with a rider, it has a 100% chance of transitioning back to the "idle" state once the ride is completed.

Given this information, if a driver is currently idle, use the Markov chain to calculate the probability that the driver will remain idle, begin waiting for a ride request, or become matched with a rider on the next time step.

***Question 3 :*** Suppose you are designing a new delivery robot for a warehouse and you want to optimize its route through the warehouse. You decide to use a Markov chain to model the robot's movements.

The possible states of the Markov chain are the locations in the warehouse, and the transitions between states represent the robot moving from one location to another. The transitions between states are governed by the following rules:

If the robot is currently at location A, it has a 30% chance of staying at location A, a 40% chance of moving to location B, and a 30% chance of moving to location C.

If the robot is currently at location B, it has a 50% chance of staying at location B and a 50% chance of moving to location C.

If the robot is currently at location C, it has a 20% chance of staying at location C, a 30% chance of moving to location A, and a 50% chance of moving to location B.

Given this information, if the robot is currently at location A, use the Markov chain to calculate the probability that it will remain at location A, move to location B, or move to location C on the next time step.