Performance modeling for Computer systems
(Midsem 30% weightage, 40 marks)

1 Each Question is of 10 marks

1. For $i = 1, 2, 3$, suppose X_i is an exponential random variable with parameter λ_i. Furthermore, X_i's are independent. Obtain the probability that X_3 is less that both X_1 and X_2.

2. Model the Poisson Process as a CTMC and write down its transition probability matrix $P(t)$. What is the dimension of the matrix $P(t)$ and derive the expression for $p_{ij}(t)$.

3. Derive the one step transition probability matrix P for the Binomial process.

4. Consider a Continuous time Markov coin with the following rate matrix $Q = \begin{bmatrix} -\lambda_H & \lambda_H \\ \lambda_T & -\lambda_T \end{bmatrix}$. Obtain its stationary distribution. Now consider the corresponding embedded DTMC and derive its transition probability matrix.