EE 633, Queueing Systems (2016-17F)
Quiz – I

Our bank operates with two tellers - Teller A and Teller B. Teller A works at rate $\boldsymbol{\mu_A=2\mu}$ while Teller B works at rate $\boldsymbol{\mu_B=\mu}$ where the service times are exponentially distributed. *An arrival coming when the system is empty will always go to Teller A for service*, i.e. Teller A is the preferred server

Customers arriving to the bank come from a Poisson process with rate λ.

For notational convenience, use $\boldsymbol{\rho=\lambda/\mu}$ in your expressions and equations.

(a) Draw the State Transition Diagram of the system using an appropriate definition of the system state. **[2]**

(b) Write the balance equations that you would need to solve for this system. **[2]**

(c) Solve the balance equations to obtain all the state probabilities as functions of p_2 = P{2 users in the system}. Specify the condition under which the system will have an equilibrium solution. **[2+1]**

(d) Write the Normalization Condition that would be needed to solve for p_2. **[1]**
Note that you are only required to write the equation in terms of $\boldsymbol{p_2}$ and $\boldsymbol{\rho}$. You are not required to solve this to actually find $\boldsymbol{p_2}$.

(e) At the end of the year, the Bank Manager decides to give Teller B a bonus of Rs Z. How much should he/she pay Teller A? (You must **FIRST** give your justification for your answer and then give your calculations.). **Note that you do not need to know the actual value of $\boldsymbol{p_2}$ to decide this.** **[2]**