EE 679, Queueing Systems (2001-02F)
Test -2, September 19, 2001

Max. Marks = 25 **Time = 60 minutes**
Attempt both problems

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1. Consider a M/M/- type queue with the following arrival and service rates -

$\lambda_k = (k+2)\lambda$ for $k=0,1,2,.....$
$\mu_k = k\mu$ for $k=1,2,3,.....$

(a) Obtain the state probabilities of the system under equilibrium conditions expressing your results in terms of λ, μ or $r = \lambda/\mu$ [5]

(b) Find the mean number in the system [5]

(c) What is the condition under which the system will have an equilibrium solution? [2]

2. In an M/M/1 queue, *once the system becomes empty, the server does not start serving again until the number of jobs in the system becomes 3*. Otherwise, the system behaves normally with an average arrival rate of λ and an average service rate of μ.

(a) Draw a State Transition Diagram for the system [4]

(b) Find the state probabilities of the system under equilibrium conditions and use these to give the probability of finding k users in the system for $k=0,1,2,3.....$ Expressing your results in terms of λ, μ or $r = \lambda/\mu$ [5]
[*Note: Marks will only be given for suitably simplified answers*]

(c) Does the server work more or less here than in a normal M/M/1 queue? (Give a quantitative answer based on probability values.) [4]