THE GENERATING FUNCTION OF THE NUMBER IN M/G/1 QUEUE WITH RESTPERIODS

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It is the detailed study of the M/G/1 queue which is a single server system with Poisson arrivals and arbitrary service distribution. Consider the queueing wherein the server is busy as long as there are customers in the main stream; but takes a rest period when the system becomes empty. Upon termination of a restperiod, the server returns to the system and begins to serve those customers, if any, that have arrived during the restperiod. However, if the server finds the system empty at the end of a restperiod, he immediately takes another restperiod and so on. Such a quene is known as a M/G/1 queue with restperiods, studied by scholl and Kleinrock.

I have supplied an independent proof for the main theorem stated in their paper using the familiar method called "imbedded Markov Chain" approach. The result proved is the generating function of the number in queue M/G/1 with restperiods and given by,

$$Q(z) = (B^*(\lambda-\lambda z)/(\lambda E(T_0)))/((1-\rho)(1-P^*(\lambda-\lambda z)))/(B^*(\lambda-\lambda z)-z))$$

References:

Cooper, R.B. (1970) Queues served in cyclic order : waiting times. Bell. Syst. Tech. Journal, 49: 399-413

Scholl,M., and Kleinrock,L. (1983)On the M/G/1 Queue with restperiods and certain service-independent queuing disciplines. Operations Research 31: 705-719,

Kleinrock,L. (1975) 'Queueing Systems', Vol.1, New York, Wiley Interscience.