On optional deterministic server vacations in a batch arrival queueing system with a single server providing first essential service followed by one of the two types of additional optional service

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Abstract:
We analyze a batch arrival queue with a single server providing first essential service (FES) followed by one of the two types of additional optional service (AOS). After completion of the FES, a customer has the option to leave the system or to choose one of the two types of AOS and as soon as a customer leaves (either after the FES or after completing one of the chosen AOS, the server may take a vacation or may continue staying in the system. The vacation times are assumed to be deterministic and the server vacations are based on Bernoulli schedules under a single vacation policy. We obtain explicit queue size distribution at a random epoch under the steady state. In addition, some important performance measures such as the steady state expected queue size and the expected waiting time of a customer at a random epoch are obtained. Further, some interesting particular cases are also discussed.