

Solution to Problem 2.17

This is actually the same queue as the one considered in Sec. 2.10.1 except that the batch sizes now range from 0 to ∞ . In Sec. 2.10.1, zero-sized batches were not allowed and hence the batch sizes could only range from 1 to ∞ .

Let $\mathbf{b}^*(z) = \sum_{r=1}^{\infty} \mathbf{b}_r^* z^r$ be the batch generating function for Sec. 2.10.1 and $\mathbf{b}(z) = \sum_{r=0}^{\infty} \mathbf{b}_r z^r$ be the

batch generating function for this problem. Then we can see that $\mathbf{b}_r^* = \frac{\mathbf{b}_r}{1 - \mathbf{b}_0}$ and

$\mathbf{b}^*(z) = \frac{\mathbf{b}(z) - \mathbf{b}(0)}{1 - \mathbf{b}(0)}$. If we use $\mathbf{b}^*(z) = \frac{\mathbf{b}(z) - \mathbf{b}(0)}{1 - \mathbf{b}(0)}$ instead of $\mathbf{b}(z)$ in the results of Sec. 2.10.1,

the results obtained will be the same as the ones asked for in this problem. The direct approach applying the same methods as in Sec. 2.10.1 will verify this.