EE368 Assignment 2 **(Solution)**

Q 1. The advantage of this alternative method is that it saves the extra expense of shifting the elements of the queue each time the remove operation is called. Instead, the shift only occurs when the original allotted space runs out - only when it s needed. Therefore, one large shift is performed at one time to provide extra space, rather than numerous small shifts.

The disadvantage of this method is that program execution is temporarily halted to take care of the internal shifting.

Q2 Avg. Queue Length = $N - 1$

where N = Avg # of customers in the system $= \frac{\rho}{1-\rho}$

Since $\frac{\rho}{1-\rho} = 10 \implies \rho = \frac{10}{11} = \frac{\lambda}{\mu} = \frac{\lambda}{30}$

therefore, $\lambda = \frac{300}{11} = \boxed{27.27}$ jobs/hour

Q3. Avg. Waiting Time (according to Little's theorem)

$T = \frac{N}{\lambda}$ where $N = \frac{\rho}{1-\rho}$ note: $\rho = \frac{20}{30} = \frac{2}{3}$

Therefore, $T = \frac{1}{10}$ min/jobs,

So, $T_q = T - \frac{1}{\mu} = 0.066..$ min/job $= \boxed{4 \text{ Sec/Job}}$

Prob (system is empty) $= P_0 = (1-\rho)\rho^0 = \boxed{1-\rho = \frac{1}{3}}$

Q4 Note: $N = \lambda T = \frac{\rho}{1-\rho} \implies 5\lambda = \frac{\lambda/2}{1-\lambda/2}$

$\implies 5\lambda = \frac{\lambda}{2-\lambda}$, therefore $2-\lambda = \frac{1}{5} \implies \lambda = 1.8$ customers/min