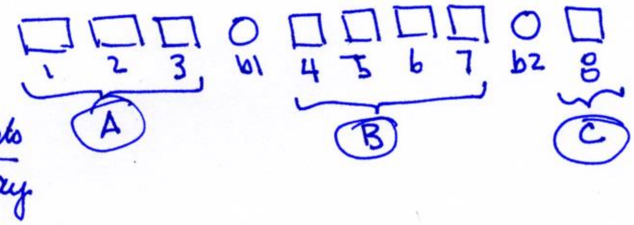
HWK # 7 (Mfg System HWK #4) Fall 2013

Time and Rate

1. Production Flow Issues

Solution 1. Production Flow Issues



$\frac{1}{\lambda} = 100 \frac{\text{parts}}{\text{day}}$

rates at (A) $\frac{1}{1 + 3 \times \frac{1}{10}} = \frac{1}{1.3} = 0.77 \quad \times 100 = 77$ parts/day

(B) $\frac{1}{1 + 4 \times \frac{1}{10}} \quad \frac{1}{1.4} = 0.71 \times 100 = 71$ "

(C) $\frac{10}{11} = 0.91$ 91 "

b1 grows because section (B) is a bottle neck by 77-71 = 6 parts/day

b2 b2 could be estimated from M/M/1 queue

assumption: provided rates are distributed exponential, then

$\lambda = 71$ and $\mu = 91$

for M/M/1 $L = \lambda W$

$W = \frac{1}{\mu - \lambda}$; $L = \frac{\lambda}{\mu - \lambda} = \frac{71}{91 - 71} = \frac{71}{20} = 3.55$ parts

assumption would need to be tested

2. TPS Cell

Solution 2. TPS Cell

a) walking time + manual time = 25 + 60 = 85 sec

$\lambda = \frac{1 \text{ part}}{85 \text{ sec}}$

L = 5 parts (4 in machines, 1 in operators hand)

$L = \lambda W \Rightarrow W = 5 \times 85 \text{sec} = 7.1$ minutes

b) $11 \text{min} \times \frac{60 \text{sec}}{\text{min}} = 660 \text{sec}$ of cutting time

$\frac{660}{55/\text{cycle}} = 12$ cycles at $\frac{1 \text{ part}}{85 \text{ sec}} = 0.71 \frac{\text{parts}}{\text{min}}$

here we are treating this system as deterministic

On the 13th cycle the cutting insert must be replaced. Then machine time for mach #1 is $60\text{sec} + 10\text{sec} + 55\text{sec} = 125 \text{sec}$

60 sec: insert replacement; 10 sec: manual time (fixture part); 55 sec: run time

$\Rightarrow 0.48 \frac{\text{parts}}{\text{min}}$

ave prod rate $= \frac{12}{13} 0.71 + \frac{1}{13} 0.48 = 0.69 \frac{\text{parts}}{\text{min.}}$

3. Output of photovoltaic (PV) system in cloudy location.

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PV out put 20% of radiated power

sunny 1 hr $1000 W/m^2 \times .2 = 200$

light clouds 30 min $500 W/m^2 \times .2 = 100$

dark clouds 10 min $100 W/m^2 \times .2 = 20$

100 min

ave power $200 \times \frac{60}{100} + 100 \times \frac{30}{100} + 20 \times \frac{10}{100}$

$120 + 30 + 2 = 152 W/m^2$

The day and night average would be 152/2 = 76 W/m2.