Solution

1.

$$r_a = 20 \text{ q/hr}$$

(a) $$t_a = \frac{1}{r_a} = \frac{1}{20} = 0.05 \text{ hr/q}$$

(b) $$c_a^2 = \frac{\sigma_a^2}{t_a^2} = \frac{0}{(0.05)^2} = 0$$

(c) $$c_a^2 = \frac{\sigma_a^2}{t_a^2} = \frac{(0.05)^2}{(0.05)^2} = 1$$

(d) $$\sigma_a^2 = (0.05)^2 = 0.0025 \text{ hr}^2$$

(e) $$\sigma_a = \frac{5}{60} \text{ hr}, \quad c_a^2 = \frac{\sigma_a^2}{t_a^2} = \frac{\left(\frac{5}{60}\right)^2}{(0.05)^2} = 2.777778$$

3.

		1	
Arrival Rate	(r_a, q/hr)	18.75	
Arrival SCV	(c^2_a)	1	
Natural Process Time	(t_0, hr)	0.2	
Var of Nat Proc Time	(hr^2)	0.04	
Natural Process SCV	(c^2_0)	1	
MTTF	(hr)	20	
MTTR	(hr)	2	
Repair Time SCV	(c^2_r)	2.5	
Availability	(A)	0.909091	
Effective Process Time	(t_e, hr)	0.22	
Eff Process Time SCV	(c^2_e)	3.892562	
Number of M/C	(m)	5	
Utilization	(u)	0.825	
Yield	(y)	0.8	
Departure Rate (r_a*y)	(r_d, q/hr)	15	
Departure SCV	(c^2_d)	1.880452	
Cycle Time in Queue	(CT_q, hr)	0.382873	
Cycle Time at W/S	(CT, hr)	0.602873	(a)
WIP in Queue (r_a*CT_q)	(q)	7.178873	
WIP at W/S	(q)	11.30387	
WIP on M/C	(q)	4.125	(b)
Eff Cap	(r_e, q/hr)	22.72727	(c)