Chapter 5
Multiple-Stage Single-Product Factory Models

5.1.
$C_d^2 = 1.36125$

5.3.
$WIP(1) = 6.375, \quad WIP(2) = 17.427, \quad WIP(3) = 20.842.$
$WIP_s = 44.645$
$th_s = 3$/hr
$CT_s = 14.882$ hr

5.5.
$WIP(1) = 5.2, \quad WIP(2) = 3.787, \quad WIP(3) = 8.963.$
$WIP_s = 17.951$
$th_s = 0.5$/hr
$CT_s = 35.901$ hr

5.9. (a)
$th_s = 0.51 \Rightarrow WIP_s = 20.247$ and $CT_s = 39.699$.
$th_s = 0.53 \Rightarrow WIP_s = 26.807$ and $CT_s = 50.579$.
$th_s = 0.55 \Rightarrow WIP_s = 38.969$ and $CT_s = 70.852$.

(b) $C_s^2(3) = 1.315 \Rightarrow$ 34.3% reduction
(c) $E[T_3] = 1.344$ hr
(d) $E[T_3] = 1.6 \Rightarrow$ service rate $= 0.625$/hr

5.11.
Note that Figure 5.6 should indicate that u=0.8 (i.e., utilization not service rate).

α	C_d^2	λ_1	$C_d^2(1)$	λ_2	$C_d^2(2)$
1/3	2.46	1.333	1.487	2.667	1.973
1/2	2.46	2.000	1.730	2.000	1.730
3/4	2.46	3.000	2.095	1.000	1.365

5.13.
$\lambda_1 = 10.0$
$\lambda_2 = 7.5$
$\lambda_3 = 10.0$

5.15.
$\lambda_1 = 18.2222$
$\lambda_2 = 15.6667$
$\lambda_3 = 15.0$

5.19.
Note that this problem must assume two machines per workstation instead of the single-serve workstatons as given in the text.

(a)
$WIP(1) = 4.902, \quad WIP(2) = 6.893, \quad WIP(3) = 2.118.$
$WIP_s = 13.920$
$th_s = 12$/hr
$CT_s = 1.160$ hr

(b)
$WIP(1) = 6.782, \quad WIP(2) = 15.911, \quad WIP(3) = 3.839.$
$WIP_s = 26.531$
$th_s = 12$/hr
$CT_s = 2.211$ hr

5.21.
Note that Problem 5.21 should refer to Problem 5.18 instead of 5.16 for reworking with a spreadsheet.

5.22.
Note that Problem 5.22 should refer to Problems 5.19 and 5.20 for reworking with a spreadsheet.