SOLUTIONS TO L34 FINAL EXAM, S03

(1)

	1	2	3	4	5	6
S	300	380	480	550	610	710
O	140	240	380	515	585	665
Δ	160	140	100	35	25	45
ATP	~~25~~	~~25~~	~~25~~	~~25~~	25	~~45~~
RFQ	0	10	20	20	30	30

(a) 10

(b)

	1	2	3	4	5	6
Cum Q	10	20	20	20	25	30
Q	0	10	10	0	5	5

(c)

ATP	0	0	0	0	0	15

(d)

S	300	380	480	550	600	700
O	140	240	380	515	585	665
Δ	160	140	100	35	15	35
ATP	~~25~~	15	15	15	15	35
RFQ	0	10	20	20	30	70
Cum Q	0	10	15	15	15	30
Q		10	5	0	0	15

(2.)

2.5 HRS OT
85% RE
35 LOTS, 5 RE-WORKED

APT = 0.5

(a) $A = \frac{21.5}{24} \approx 0.89583$

$U/A = \frac{35(0.5)}{21.5} = 0.81395$

$OEE = \frac{30(0.5)(0.85)}{24} = 0.53125$

(b) $.81395 = \frac{0.5(1+.02)(1.06X)}{21.5} \Rightarrow X = 32.371$

$OEE = \frac{(32.371)(0.5)(0.85)}{24} = 0.57324$

(c) $0.81395 = \frac{0.5(1+.02)(1+r)30}{21.5} \Rightarrow r \approx 14.4\%$

IF ASSUME 35/40

(a) $A = \frac{21.5}{24} = 0.89583$

$U/A = \frac{40(0.5)}{21.5} = 0.9302$

$OEE = \frac{35(0.5)(0.85)}{24} = 0.6198$

(b) $0.9302 = \frac{(0.5)(1+.02)(1.06X)}{21.5} \Rightarrow X = 36.995$

$OEE = \frac{(36.995)(0.5)(0.85)}{24.0}$ 0.65

(c) $0.9302 = \frac{(0.5)(1+.02)(1+r)35}{21.5} \Rightarrow r = 12.04\%$

(6) $.81395 = \dfrac{0.5(1+.02)(1+RW)X}{21.5}$

$\Rightarrow (1+RW)X = 34.314$

$OEE = \dfrac{\frac{34.314}{1+RW}(0.5)(0.85)}{24} = .53125$

$1.144 = 1+RW$

$RW \cong 14.4\%$

$.7302 = \dfrac{(0.5)(1+.02)(1+RW)X}{21.5}$

$\Rightarrow (1+RW)X = 39.214$

$OEE = \dfrac{\left(\frac{39.214}{1+RW}\right)(0.5)(0.85)}{24} = 0.6198$

$1.1204 = 1+RW$

$RW \cong 12.04\%$

(3.)

$UCL = 80 = \mu + 3\sqrt{\mu}$

$USL = 70$

(a) $\bar{x}$-CHART

(b) $C_{PK} = \dfrac{USL - \mu}{3\sqrt{\mu}}$

$(80-\mu)^2 = 9\mu$

$6400 - 160\mu + \mu^2 = 9\mu$

$\mu^2 - 169\mu + 6400 = 0$

$\mu = \dfrac{169 \pm \sqrt{169^2 - 4(6400)}}{2}$

28561
25600
2961
54.41

$= \dfrac{169 - 54.41}{2} = 57.292$

$C_{PK} = \dfrac{70 - 57.292}{3\sqrt{57.292}} = \dfrac{12.708}{22.7074} = 0.560$

(c) $Y = P_{ROB}\{P_{ROT} < USL\}$

$= P_{ROB}\left\{Z < \dfrac{70 - 57.292}{\sqrt{57.292}}\right\} = \dfrac{12.708}{7.569} = 1.678$

$= .953$

(d) WANT $\dfrac{70-\mu}{\sqrt{\mu}} = 2.06$

(4.)

$$\text{OUTPUT/CYCLE} = 4n\,\text{PROB}\{T>n\} + \sum_{t=1}^{n} 4(t-1)\,\text{PROB}\{T=t\}$$

$$\text{CYCLE LENGTH} = (8n+12)\,\text{PROB}\{T>n\} + \sum_{t=1}^{n} (8t+12)\,\text{PROB}\{T=t\}$$

MAX OUTPUT/TIME

n	PROB{T=n}	PROB{T>n}	NUM	DEN	RATIO
1	.10	.90	4(.90)	20	$\frac{3.6}{20} = .18$
2	.15	.75	8(.75)+4(.15)	20(.1)+28(.9)	$\frac{6.6}{27.2} = .243$
3	.20	.55	12(.55)+8(.2)+4(.15)	20(.1)+28(.15) +36(.75)	$\frac{8.8}{37.2} = .236$
4	.30	.25	16(.25)+12(.3)+8(.2)+4(.15)	20(.1)+28(.15) +36(.2)+44(.55)	$\frac{9.8}{37.6} = .261$
5	.25	0			

(b) REDUCE FREQ TO USE SDCE MORE AND ↑ YIELD

(5.) $TCT = .9DACT = .9(40) = 36$

$ACT(W) = 400$
$ACT\,CT = 40$ $\Rightarrow PK = 10$

(a) $TW = 360$

(b) $BT = 36 - 20 = 16$

$\Sigma \sigma_i^2 = 2.1 + 2.9 + 3.0 = 8 \Rightarrow K = 2$

$TCT_1 = 4 + 2(2.1)$ $\quad TW_1 = 50 + 42 = 82$

$TCT_2 = 5 + 2(2.9)$ $\quad TW_2 = 50 + 58 = 108$

$TCT_3 = 7 + 2(3.0)$ $\quad TW_3 = 70 + 60 = 130$

$TCT_4 = 4$ $\quad TW_4 = 40$

(c) ~~$TW_1 = .9(94) = 84.6$~~ ~~$BW = 84.6 = 1.65\sigma$~~

~~$TW_2 = .9(111) = 99.9$~~ ~~$BW = 49.9 = 1.72\sigma$~~

~~$TW_3 = .9(123) = 110.7$~~ ~~$BW = 50.7 = 1.69\sigma$~~

~~$TW_4 = .9(78) = 64.8$~~

$TW_1 = .9(84) = 75.6$ $\quad BW = 35.6$ $\quad K = 1.69$

$TW_2 = .9(111) = 99.9$ $\quad = 49.9$ $\quad K = 1.72$ ✓

$TW_3 = .9(135) = 121.5$ $\quad = 51.5$ $\quad K = 1.66$

$TW_4 = .9(72) = 64.8$

ANSWER $K = 2.0$ ✓

(6.)

$$DY = DY_0 e^{-A(D_1 f_1 + D_2 f_2)}$$

$$\ln DY = \ln DY_0 - 0.4 D_1 f_1 - 0.4 D_2 f_2$$

$$\ln .90 = \ln DY_0 - 0.4(.20) f_1 - 0.4(.5) f_2$$
$$\ln .88 = \ln DY_0 - 0.4(.5) f_1 - 0.4(.5) f_2$$
$$\ln .92 = \ln DY_0 - 0.4(.5) f_1 - 0.4(.1) f_2$$

$$-0.1054 = \ln DY_0 - .08 f_1 - .2 f_2$$

$$-0.1278 = \ln DY_0 - .2 f_1 - .2 f_2$$

$$-0.0834 = \ln DY_0 - .2 f_1 - .04 f_2$$

$$-0.04424 = -.16 f_2 \Rightarrow f_2 = 0.2765$$

$$-.0224 = -.12 f_1 \Rightarrow f_1 = .1867$$