THE HONG KONG POLYTECHNIC UNIVERSITY
HONG KONG COMMUNITY COLLEGE

Subject Title : Engineering Economics **Subject Code** : CCN3134

Session : Semester Two, 2015/16

Numerical Answers

Question B1

(b)(ii) The two break-even points are 7.25 and 82.75
→ range of profitable demand is 8 to 82 units

(b)(iii) Maximum profit = \$142.50 ≅ \$143

(c)(i) Weighted index in 2015 = 152.50

(c)(ii) Construction cost in 2020 = 97.4262 million ≅ 97.43 million

Question B2

(a)(ii) Present Value, PV(12%) = \$438.559 ≈ \$438.56

(b)(ii) Value of D = \$2,765.0673 ≅ \$2,765.07

(c) Value of G = \$733.6749 ≅ \$ 733.67

Question B3

(b)(ii) Present-worth, PW(12%) = \$7,606.30 > 0 → economically justified.

(b)(iii) Using PW(10%) = \$16,058.55 and PW(15%) = –\$3,031.95 for linear interpolation
→ IRR ≅ 14.21% > 12% → economically justified.

(b)(iv) Given 10% reinvestment rate,
PW(10%) of expenses = \$85,747.50, and
FW(10%) of revenues = \$264,061.00
→ ERR = 11.9047% ≈ 11.90%

Question B4

(b)(i) For Machine A: $AW(12\%)_A$ = \$3,151.60

For Machine B: $AW(12\%)_B$ = \$8,886.40 > $AW(12\%)_A$ → Choose B

(b)(ii) For Machine A: $FW(12\%)_A = \$18,888.8681 \approx \$18,888.87$

For Machine B: $FW(12\%)_B = \$72,104.98 > AW(12\%)_A \rightarrow$ Choose B

(c) Incremental analysis by PW method, $PW_\Delta(12\%) = \$1,279.656 \approx \$1,279.66 > 0 \rightarrow$ Choose B

Question B5

(a)(ii) EUAC = \$301,596.065

(a)(iii) Conventional B–C ratio with AW = \$250,000 / \$301,596.065 = 0.828923281 ≈ 0.83 < 1

(a)(iv) The appropriate amount on the bid = \$1,614,667.177 ≈ \$1,614,667.18

(b)(i) Defender: PW(12%) = –\$920,956

Challenger: PW(12%) = –\$977,243.6 < –\$920,956 → not to replace defender

(b)(ii) Defender: AW(12%) = –\$255,480

Challenger: AW(12%) = –\$271,090 < –\$255,480 → not to replace defender

Question B6

(a)(i) Cost basis (B) = \$530,000

Annual depreciation amount at year 7, d_7 = \$48,000

Cumulative depreciation amount at year 7, cd_7 = \$336,000

Book value amount at year 7, BV_7 = \$194,000

(a)(ii) R = 1.5/10 = 0.15

Annual depreciation amount at year 7, $d_7 = \$29,983.3865 \approx \$29,983.39$

Cumulative depreciation amount at year 7, $cd_7 = \$360,094.1432 \approx \$360,094.14$

Book value amount at year 7, $BV_7 = \$169,905.8568 \approx \$169,905.86$

(a)(iii) For an average of 30,000 hours of operation before replacing:

Depreciation rate per hour of operation = \$16 per hour

If keep the machine longer than 30,000 hours,

Projected book value after 40,000 hours of operation = -\$110,000 < 0 → \$0

(b)(ii) The general price inflation rate per year for 2002 – 2010, $f \approx 0.025 = 2.5\%$

(b)(iii) John's real-dollar salary equivalent value = \$44192.7144 ≈ \$44192.71