# Solutions to EA-2(A) Examination
# Fall, 2006

## Question 1

The normal cost in the unit credit cost method is equal to the present value of the accrual for the year. Based upon the given benefit formula, the annual accrual for 2006 is:

1.3% × \$75,000 = \$975

Using the retirement rates assumed as of 1/1/2006, 33% of all retirements are assumed to occur at age 63, 33.5% of all retirements are assumed to occur at age 64 (50% × 67%), and 33.5% of all retirements are assumed to occur at age 65 (50% × 67%). Under this assumption, the normal cost can be calculated as being equal to the sum of the present value of the annual accrual payable at each possible retirement age, adjusted for the probability of retirement at that age.

Early retirement reduction at age 63 = 4% × 2 years = 8%

There is no early retirement adjustment factor at age 64 since the participant has 30 years of service.

$$NC_{1/1/2006} = (975 \times (1 - 8\%) \times \ddot{a}_{63}^{(12)} \times v^4 \times 33\%) + (975 \times \ddot{a}_{64}^{(12)} \times v^5 \times 33.5\%) + (975 \times \ddot{a}_{65}^{(12)} \times v^6 \times 33.5\%)$$

$$= 2{,}195 + 2{,}208 + 2{,}011 = 6{,}414$$

Answer is B.

## Question 2

Under the entry age normal cost methods, it should be recalled that:

PVFB = AL + PVFNC = 450,000 + (25,000 × 10) = 700,000

The normal cost under the aggregate method is:

$NC_{1/1/2006}$ = (PVFB – Actuarial assets)/PV of future service
= (700,000 – 451,000)/10 = 24,900

Note that the actuarial value of assets is reduced by the credit balance ($0 in this question) under the aggregate method.

The normal cost as of the end of the year is:

$NC_{12/31/2006}$ = 24,900 × 1.07 = 26,643

This is also the minimum required contribution (subject to the full funding limitation).

The ERISA full funding limitation (based upon the entry age normal cost method – see Revenue Ruling 81-13) is equal to the accrued liability plus normal cost, rolled forward with valuation interest to the end of the year, less the smaller of the actuarial or market value of the assets (reduced by the credit balance), rolled forward with valuation interest to the end of the year.

ERISA full funding limit = (450,000 + 25,000 – 449,000) × 1.07 = 27,820

The overall full funding limitation is equal to the greater of the ERISA or the RPA'94 full funding limitation. The RPA'94 full funding limitation is equal to 90% of the current liability (including the expected increase in liability due to the current year accruals), rolled forward with current liability interest to the end of the year (not needed in this question since the current liability provided is as of the last day of the year), less the actuarial value of the assets (unreduced by the credit balance), rolled forward with valuation interest to the end of the year.

RPA'94 full funding limit = (90% × 569,000) – (451,000 × 1.07) = 29,530

The overall full funding limit is 29,530.

The minimum required contribution is not limited by the full funding limit, and is 26,643.

Answer is B.

## Question 3

The smoothed value method described in section 3.15 of Revenue Procedure 2000-40 states that when a 5-year smoothing period is used, the market value of assets as of a valuation date are adjusted by 4/5 of the asset gain or loss from the prior year, 3/5 of the asset gain or loss from the second prior year, 2/5 of the asset gain or loss from the third prior year, and 1/5 of the asset gain or loss from the fourth prior year. Losses are added to and gains are subtracted from the market value of assets.

The asset losses for 2002, 2003 and 2004 have been provided. The asset gain or loss for 2005 can be determined by comparing the expected assets at the end of 2005 with the actual market value at the end of 2005. Note that interest is pro-rated for transactions that occur during the year. The pro-ration can be done using either simple or compound interest (simple interest will be used in this solution). Note that actual earnings are irrelevant to the determination of the expected assets.

$\text{Expected assets}_{12/31/2005} = (355{,}000 \times 1.07) + ([15{,}000 - 10{,}000] \times 1.035) = 385{,}025$

$\text{2005 asset loss} = 385{,}025 - 345{,}000 = 40{,}025$

$$\text{1/1/2006 smoothed value} = 345{,}000 + (4/5 \times 40{,}025) + (3/5 \times 75{,}000) + (2/5 \times 34{,}000) + (1/5 \times 45{,}000) = 444{,}620$$

The 1/1/2006 smoothed value must be reduced to 414,000 since the actuarial value of assets can never exceed 120% of the market value (120% of 345,000 = 414,000). See the description in section 3.15 of Revenue Procedure 2000-40.

Answer is D.

## Question 4

The outstanding balance as of 1/1/2006 of the initial unfunded liability is:

$200{,}000 \times (\ddot{a}_{\overline{26}|} / \ddot{a}_{\overline{30}|}) = 190{,}599$

According to the balance equation,

UL = Outstanding balance – Credit balance – Reconciliation account balance

There is clearly no reconciliation account balance in this question (it is not given, there is no late interest charge, no additional funding charge, and no waived funding deficiency).

Prior to the assumption change, the unfunded liability is $300,000. Using the equation of balance,

300,000 = 190,599 + outstanding balance of gains and losses – 7,000
Outstanding balance of gains and losses = 116,401

Since there were no gains or losses prior to 2005, $116,401 must be the 2005 loss.

Due to the assumption change, a new base must be set up equal to the difference between the unfunded liability under the new assumptions and the unfunded liability under the old assumptions.

Assumption change base = $400,000 – 300,000 = $100,000.

The normal cost is equal to the present value of the benefit accruing during the current year (using the new assumptions). Since there is no benefit formula provided, it must be assumed that the benefit formula is a level unit benefit formula, incremental over all years of service. Therefore, another way to determine the normal cost is to divide the accrued liability by the total years of accrual service to date.

$AL_{1/1/2006}$ = UL + Actuarial assets = 400,000 + 100,000 = 500,000
$NC_{1/1/2006}$ = 500,000/25 years = 20,000

The minimum required contribution for 2006 as of 12/31/2006 is:

$$(20{,}000 + \frac{200{,}000}{\ddot{a}_{\overline{30}|}} + \frac{116{,}401}{\ddot{a}_{\overline{5}|}} + \frac{100{,}000}{\ddot{a}_{\overline{10}|}} - 7{,}000) \times 1.07$$
$$= (20{,}000 + 15{,}063 + 26{,}531 + 13{,}306 - 7{,}000) \times 1.07 = 72{,}653$$

Answer is D.

## Question 5

The 2006 minimum required contribution without regard to the full funding limit is:

2006 minimum = (40,000 × 1.07) + 24,000 = 66,800

The ERISA full funding limitation (based upon the entry age normal cost method – see Revenue Ruling 81-13) is equal to the accrued liability plus normal cost, rolled forward with valuation interest to the end of the year, less the smaller of the actuarial or market value of the assets (reduced by the credit balance), rolled forward with valuation interest to the end of the year.

ERISA full funding limit = (750,000 + 30,000 – 730,000) × 1.07 = 53,500

The overall full funding limitation is equal to the greater of the ERISA or the RPA'94 full funding limitation. The RPA'94 full funding limitation is equal to 90% of the current liability (including the expected increase in liability due to the current year accruals), rolled forward with current liability interest to the end of the year (not needed in this question since the current liability provided is as of the last day of the year), less the actuarial value of the assets (unreduced by the credit balance), rolled forward with valuation interest to the end of the year.

RPA'94 full funding limit = (90% × 939,000) – (730,000 × 1.07) = 64,000

The overall full funding limit is $64,000. This is less than the 2006 minimum under the cost method, so the minimum required contribution for 2006 is $64,000.

Answer is C.

## Question 6

The normal cost under the aggregate method is:

$NC_{1/1/2006}$ = (PVFB – Actuarial assets)/PV of future service

The present value of future benefits (PVFB) must include both the retirement benefits and the disability benefits. Disability is assumed to occur at age 64, and retirement is assumed to occur at age 65.

Retirement benefit at age 65: 2% × \$100,000 × $1.04^2$ × 36 years of service = \$77,875
Disability benefit at age 64: 2% × \$100,000 × 1.04 × 35 years of service = \$72,800

Present value of retirement benefit = $77{,}875 \times \ddot{a}^{(12)}_{65(\text{healthy})} \times v^2 \times {}^{(i)}p_{64}$
$= 77{,}875 \times 9.24 \times 0.873439 \times 0.8 = 502{,}797$
Present value of disability benefit = $72{,}800 \times \ddot{a}^{(12)}_{64(\text{disabled})} \times v \times {}^{(i)}q_{64}$
$= 72{,}800 \times 6.88 \times 0.934579 \times 0.2 = 93{,}619$

Note that the notation ${}^{(i)}q_{64}$ represents the probability that disability occurs at age 64.

PV of future service = $({}^{(i)}q_{64} \times \ddot{a}_{\overline{1}|j}) + ({}^{(i)}p_{64} \times \ddot{a}_{\overline{2}|j})$ (where j = 1.07/1.04 – 1 = .028846)
$= (0.2 \times 1) + (0.8 \times 1.971963) = 1.777570$

$NC_{1/1/2006}$ = (502,797 + 93,619 – 150,000)/1.777570 = 251,138

Note that the actuarial value of assets is reduced by the credit balance (\$0 in this question) under the aggregate method.

Answer is B.

## Question 7

Amortization of initial unfunded liability:

$1{,}200{,}000 / \ddot{a}_{\overline{30}|} = 90{,}377$

Since the amortization charges as of 1/1/2005 are $100,000, the additional amount must be the amortization of the 2004 experience loss. The amortization of the 2004 experience loss is:

$100{,}000 - 90{,}377 = 9{,}623$

The unfunded liability as of 1/1/2006 (using the balance equation) is:

UL = Outstanding balance – Credit balance – Reconciliation account balance

$= 90{,}377\,\ddot{a}_{\overline{28}|} + 9{,}623\,\ddot{a}_{\overline{4}|} - 20{,}000$

$= 1{,}173{,}700 + 34{,}877 - 20{,}000 = 1{,}188{,}577$

Actual UAL as of 1/1/2006 = AL – Actuarial assets = 1,800,000 – 400,000 = 1,400,000

There is an experience loss in 2005 since the actual UAL exceeds the expected UL.

2005 experience loss = 1,400,000 – 1,188,577 = 211,423

The minimum required contribution for 2006 as of 12/31/2006 is:

$$(250{,}000 + 90{,}377 + 9{,}623 + \frac{211{,}423}{\ddot{a}_{\overline{5}|}} - 20{,}000) \times 1.07$$

$$= (250{,}000 + 90{,}377 + 9{,}623 + 48{,}191 - 20{,}000) \times 1.07 = 404{,}664$$

Answer is D.

## Question 8

The initial base must first be determined. Using the balance equation, the outstanding balance as of 4/1/2006 can be determined.

UL = Outstanding balance – Credit balance – Reconciliation account balance
345,000 = Outstanding balance – 25,000
Outstanding balance = 370,000

Initial base = $370{,}000 \times (\ddot{a}_{\overline{30}|} / \ddot{a}_{\overline{21}|}) = 423{,}731$

The deductible limit is equal to the greater of the minimum required contribution as of the end of the plan year or the normal cost plus limit adjustment (where the limit adjustment is equal to the smaller of the 10-year amortization of the original base or the unamortized balance of the base) with interest to the earlier of the plan year end or the fiscal year end.

The minimum required contribution for the plan year beginning 4/1/2006 as of 3/31/2007 is:

$$(50{,}000 + \frac{423{,}731}{\ddot{a}_{\overline{30}|}} - 25{,}000) \times 1.07 = (50{,}000 + 31{,}913 - 25{,}000) \times 1.07 = 60{,}897$$

The normal cost plus limit adjustment with interest to the end of the 2006 fiscal year is:

$$(50{,}000 + \frac{423{,}731}{\ddot{a}_{\overline{10}|}}) \times 1.07^{9/12} = (50{,}000 + 56{,}383) \times 1.07^{9/12} = 111{,}921$$

Note that interest for the partial year could also be accumulated using simple interest.

Answer is D.

Note that although the deductible limit is equal to the greater of the minimum or the normal cost plus limit adjustment, it is really unnecessary to calculate the minimum in this question. The tip-off is that there is a large credit balance (large as a percentage of normal cost), so that it should be quite clear that the larger result will come from the normal cost plus limit adjustment.

## Question 9

The minimum required contribution for 2005 as of 12/31/2005 is:

$$(100{,}000 + \frac{600{,}000}{\ddot{a}_{\overline{30}|}}) \times 1.08 = (100{,}000 + 49{,}349) \times 1.08 = 161{,}297$$

The waived funding deficiency for 2005 is $161,297. This is amortized over 5 years beginning in 2006, using the greater of 150% of the Federal Mid-Term rate or the plan valuation rate. In this question the plan valuation rate is larger.

The minimum required contribution for 2006 as of 12/31/2006 is:

$$(90{,}000 + 49{,}349 + \frac{161{,}297}{\ddot{a}_{\overline{5}|}}) \times 1.08 = (90{,}000 + 49{,}349 + 37{,}405) \times 1.08 = 190{,}894$$

Answer is E.

## Question 10

When changing the cost method to the aggregate method, all amortization bases are considered fully amortized (other than IRC section 412 related bases such as waived funding deficiencies). So, the initial unfunded liability and the prior experience gains and losses can be ignored in determining the minimum funding requirement. However, there may be a credit balance or funding deficiency, so the balance equation must be checked immediately before the change in cost method.

The outstanding balance of the existing amortization bases as of 1/1/2006 is:

$$\text{Outstanding balance} = (500{,}000 \times \ddot{a}_{\overline{24}|} / \ddot{a}_{\overline{30}|}) + (8{,}000 \times \ddot{a}_{\overline{4}|} / \ddot{a}_{\overline{5}|})$$
$$= 462{,}136 + 6{,}609 = 468{,}745$$

The unfunded liability under the entry age normal method as of 1/1/2006 is:

UL = AL – Actuarial assets = 925,000 – 500,000 = 425,000

Using the balance equation:

UL = Outstanding balance – Credit balance – Reconciliation account balance
425,000 = 468,745 – Credit balance
Credit balance as of 12/31/2005 = 43,745

The actuarial value of the assets is reduced by the credit balance in determining the aggregate method normal cost. The normal cost under the aggregate method is:

$NC_{1/1/2006}$ = (PVFB – (Actuarial assets – credit balance))/(PV of future salary/annual salary)
= (1,500,000 – (500,000 – 43,745))/(9,000,000/800,000)
= 92,777

The minimum required contribution for 2006 as of 12/31/2006 is:

(92,777 – 43,745) × 1.07 = 52,464

Note that the full funding limitation can be ignored since there is not enough information to determine both the ERISA and RPA'94 full funding limitations.

Answer is D.

## Question 11

The experience gain or loss due to a participant electing to retire early is equal to the difference between the actual liability and the accrued liability under the cost method had the participant not retired.

Since Smith is 60 on 1/1/2006, the early retirement reduction (reduced for retirement prior to 62) is 8% (4% × 2 years).

The actual benefit payable to Smith is:

1.25% × \$85,000 × 28 years of service × (1 – 8%) = \$27,370

The value of Smith's retirement benefit as of 1/1/2006 is:

$\$27{,}370 \times \ddot{a}_{60}^{(12)} = \$27{,}370 \times 12.08 = \$330{,}630$

The accrued liability under the unit credit cost method is equal to the present value of the prior year accruals (using projected salary and the assumed retirement age).

$AL_{1/1/2006} = 1.25\% \times \$85{,}000 \times 1.03^2 \times 28 \text{ years of service} \times \ddot{a}_{62}^{(12)} \times v^2$
$= 1.25\% \times \$85{,}000 \times 1.03^2 \times 28 \text{ years of service} \times 11.61 \times 0.873439$
$= \$320{,}056$

The experience loss is equal to the excess of the actual liability over the expected liability.

Loss = \$330,630 - \$320,056 = \$10,574

Answer is B.

## Question 12

Collectively bargained plans that elect to use the shortfall method must charge the funding standard account with items pro-rated for the difference between the actual base units (hours worked in this question) versus the estimated base units (hours worked) for the year. The difference between the actual charge to the funding standard account (using shortfall) and the charges as they would have appeared without shortfall is the shortfall gain or loss.

Shortfall gains or losses are amortized in the funding standard account over 20 years for multiemployer plans, generally in the year beginning after the year that the bargaining agreement expires. However, if the bargaining agreement expires at the end of the year for which the shortfall gain or loss occurred, then the amortization of the shortfall gain or loss is deferred for at least one year. This is due to the fact that it is assumed that the bargaining agreement is renewed for the same period of years, and the amortization begins in the year following that renewed agreement would end (but not later than the 5th plan year after the gain or loss arose). (See IRS regulation 1.412(c)(1)-2(g)(2)(i).)

In this question, it is necessary to determine the funding standard account items for the 2005 plan year. However, any shortfall gain or loss from the year 2004 (the first year of the plan) need not be determined since that gain or loss would not begin to be amortized until 2006.

Similarly, the 2004 experience gain or loss determined under the entry age normal cost method is not to be amortized until 2006. (See IRS regulation 1.412(c)(1)-2(h)(2)(i).)

Therefore, the only funding standard account items in 2005 are the normal cost, and the amortization of the initial unfunded accrued liability. The sum of the 2005 normal cost, plus amortization charges, as of 12/31/2005 is:

$$(75{,}000 + \frac{750{,}000}{\ddot{a}_{\overline{30}|}}) \times 1.07 = (75{,}000 + 56{,}486) \times 1.07 = 140{,}690$$

There are 11 participants in 2005, so the assumed (estimated) hours worked for 2005 is:

$1{,}800 \times 11 = 19{,}800$

The actual hours worked can be determined from the total contributions for 2005 ($210,000) and the employer contribution rate of $10 per hour.

$\$210{,}000 = \$10 \times$ actual hours worked
Actual hours worked = 21,000

Since the actual hours worked for 2005 is more than the estimated hours worked for 2005, there is a shortfall gain. There was an excess of 1,200 hours worked. The shortfall gain for 2005 is:

$(1{,}200/19{,}800) \times 140{,}690 = 8{,}527$

Answer is D.

Note that the official answer key indicates that the correct answer range is choice C. It would appear that this result is obtained by including the amortization of the 2004 experience loss as part of the amortization charges for 2005. (This error was also made as part of the original solution to question 24 from the 2001 exam.) The Joint Board has given credit for answer choice D based upon the above correct solution.

## Question 13

The normal cost under the frozen initial liability method is:

NC = (PVFB – Actuarial assets – Unfunded liability)/(PV of future salary/salary)

The actuarial value of assets and the unfunded liability for the 2006 valuation must be developed from the 2005 valuation since they are not given for 2006.

Since 2005 was the first year of the plan, there were no assets in 2005. However, there was a contribution made for the 2005 plan year of $45,000, paid on 12/31/2005. This must be increased with interest at the actual rate of return to the 2006 valuation date. Since the valuation date for 2006 is 12/31/2006 (the last day of the year) and the actual rate of return for 2006 was 3.5%, the actuarial value of the assets as of 12/31/2006 is:

$AVA_{12/31/2006} = \$45{,}000 \times 1.035 = \$46{,}575$

Note that there are no other adjustments to the assets since there were no benefit payments.

The initial unfunded liability was $150,000 as of 1/1/2005. The unfunded liability in a subsequent valuation is:

UL = [(Prior UL + Prior NC) × (1 + valuation interest)]
– [(Prior contribution × (1 + valuation interest)]

Note that the valuation interest used to bring forward the prior liabilities is charged from the prior valuation date to the current valuation date (and for the prior contribution, from the prior contribution date to the current valuation date). So, since the valuation date was changed from the first day to the last day of the plan year, the liabilities must be brought forward with two years of interest, while the contribution only receives one year of interest since it was deposited at the end of 2005.

$UL_{12/31/2006} = [(150{,}000 + 25{,}000) \times 1.07^2] - (45{,}000 \times 1.07) = 152{,}208$

The normal cost as of 12/31/2006 is:

$NC_{12/31/2006} = (300{,}000 - 46{,}575 - 152{,}208)/(2{,}850{,}000/240{,}000) = 8{,}524$

Note that it is not necessary to determine the credit balance from 2005 since the actuarial assets are not adjusted by the credit balance in determining the normal cost under the frozen liability method.

Answer is D.

## Question 14

The unfunded liability is equal to the difference between the accrued liability and the actuarial value of assets (unadjusted for credit balances and funding deficiencies) in any immediate gain method such as entry age normal.

UL = 260,000 – 200,000 = 60,000

The balance equation must be used to determine the outstanding balance of the initial unfunded accrued liability. Note that a funding deficiency is treated as a negative credit balance for purposes of the balance equation.

UL = Outstanding balance – Credit balance – Reconciliation account balance
60,000 = Outstanding balance + 5,000 – 4,500
Outstanding balance = 59,500

Since the initial amortization base was established 3 years before 2006 (in 2003) there are 27 years remaining to amortize the outstanding balance.

The late interest charge for 2006 does not receive interest in the funding standard account. The minimum required contribution for 2006 as of 12/31/2006 is:

$[(54{,}000 + 59{,}500/\ddot{a}_{\overline{27}|} + 5{,}000) \times 1.07] + 1{,}850$

$= [(54{,}000 + 4{,}639 + 5{,}000) \times 1.07] + 1{,}850 = 69{,}944$

Answer is B.

## Question 15

The normal cost under the aggregate method is:

NC = (PVFB – Actuarial assets)/PV of future service

The present value of future benefits for the sole participant as of 1/1/2006 is:

$PVFB = 65 \times 23 \text{ years of service} \times 12\,\ddot{a}_{65}^{(12)} \times v^{15} = 65{,}023$

The aggregate normal cost as of 1/1/2006 is:

$NC = (65{,}023 - 40{,}000)/\ddot{a}_{\overline{15}|} = 2{,}568$

The minimum required contribution for 2006 (without regard to the full funding limitation) is:

2006 minimum = 2,568 × 1.07 = 2,748

The ERISA full funding limitation (based upon the entry age normal cost method – see Revenue Ruling 81-13) is equal to the accrued liability plus normal cost, rolled forward with valuation interest to the end of the year, less the smaller of the actuarial or market value of the assets (reduced by the credit balance), rolled forward with valuation interest to the end of the year. The normal cost and accrued liability under the entry age normal method must be determined. The normal cost is equal to the present value of future benefits at hire, amortized over years from hire to retirement. The accrued liability is equal to the accumulated value of the normal costs from hire to current age (past years of service).

EAN normal cost = $(65 \times 23 \text{ years of service} \times 12\,\ddot{a}_{65}^{(12)} \times v^{23}) / \ddot{a}_{\overline{23}|} = 3{,}138$

EAN accrued liability = $3{,}138 \times \ddot{s}_{\overline{8}|} = 34{,}449$

ERISA full funding limit = (34,449 + 3,138 – 38,000) × 1.07 = 0
Note that the full funding limit cannot be less than 0.

The overall full funding limitation is equal to the greater of the ERISA or the RPA'94 full funding limitation. The RPA'94 full funding limitation is equal to 90% of the current liability (including the expected increase in liability due to the current year accruals), rolled forward with current liability interest to the end of the year (not needed in this question since the current liability provided is as of the last day of the year), less the actuarial value of the assets (unreduced by the credit balance), rolled forward with valuation interest to the end of the year.

RPA'94 full funding limit = (90% × 50,000) – (40,000 × 1.07) = 2,200

The overall full funding limit is $2,200. This is less than the 2006 minimum under the cost method, so the minimum required contribution for 2006 is $2,200.

The full funding credit is the difference between the minimum required contribution (without regard to the full funding limit or any credit balance in the funding standard account) and the full funding limit.

Full funding credit for 2006 = 2,748 – 2,200 = 548

Answer is C.

## Question 16

The deductible limit under IRC section 404(a)(1)(A) for the defined benefit plan only is equal to the greater of the minimum required contribution or the normal cost plus 10-year amortization of the bases (the greater of these not to exceed the full funding limit). This is $225,000. However, if the unfunded current liability exceeds that amount it can be deducted (without regard to the full funding limit) under IRC section 404(a)(1)(D). So, the deductible limit for the defined benefit plan is equal to the unfunded current liability of 250,000. The contribution to the defined benefit plan of 240,000 does not exceed this amount, and is deductible under IRC section 404(a)(1).

The deductible limit under IRC section 404(a)(3) for the profit sharing plan only is equal to 25% of compensation. Note that the 401(k) deferrals are not subject to this limitation, as they are always deductible under IRC section 404(n). The matching contributions are subject to the deduction limit of IRC section 404(a)(3). 25% of compensation is equal to 268,750 (25% of 1,075,000). The sum of the employer matching contributions and the employer discretionary contributions is 87,500. This does not exceed 25% of compensation, and is deductible under IRC section 404(a)(3). Note that employee voluntary after-tax contributions are never deductible.

Since there is at least one participant in common in the defined benefit and profit sharing plans (all participants participate in both plans), IRC section 404(a)(7) becomes applicable. Under that section, the combined deduction limit for both plans (again, without regard to the employee 401(k) deferrals since they are always deductible under IRC section 404(n)) is generally cannot exceed the greater of:

(1) 25% of compensation
(2) The defined benefit plan minimum required contribution.

However, to the extent a contribution is made to the defined benefit plan that is deductible under IRC section 404(a)(1)(D) – the unfunded current liability – that would be deductible under IRC section 404(a)(7) provided no other contributions are deducted from either plan.

In this case, 268,750 (25% of compensation) would be deductible since that is the largest of these amounts. The total to be deducted between the two plans (again, excluding employee deferrals) is 327,500 (240,000 from the defined benefit plan and 87,500 from the profit sharing plan). The nondeductible portion of this is:

327,500 – 268,750 = 58,750

Answer is A.

## Question 17

When there is a salary scale under the unit credit cost method, salary for determining the benefit must be increased at the salary scale rate. Since the benefit is based upon final salary,

Final salary = $\$50{,}000 \times 1.04^{11} = 76{,}973$

The normal cost is equal to the present value of the current year accrual. Determining this at both the old and the new interest rate:

$NC_{old} = 2\% \times \$76{,}973 \times \ddot{a}^{(12)}_{65@8\%} \times v^{11}_{8\%} = 2\% \times \$76{,}973 \times 9.35 \times 0.428883 = 6{,}173$

$NC_{new} = 2\% \times \$76{,}973 \times \ddot{a}^{(12)}_{65@7\%} \times v^{11}_{7\%} = 2\% \times \$76{,}973 \times 10.06 \times 0.475093 = 7{,}358$

The change in the normal cost is:

7,358 – 6,173 = 1,185

Answer is D.

## Question 18

Recall the balance equation:

UL = Outstanding balance – Credit balance – Reconciliation account balance

In an immediate gain method (like unit credit), the unfunded liability is equal to the accrued liability less the actuarial value of assets.

UL = 750,000 – 450,000 = 300,000

The outstanding balance of the amortization bases can be determined from the given amortization charges/credits and the remaining period for each base.

$$\text{Outstanding balance} = 70{,}000\,\ddot{a}_{\overline{3}|} - 5{,}000\,\ddot{a}_{\overline{9}|} + 35{,}000\,\ddot{a}_{\overline{4}|} + 16{,}000\,\ddot{a}_{\overline{5}|}$$
$$= 196{,}561 - 34{,}856 + 126{,}851 + 70{,}195$$
$$= 358{,}751$$

Substituting into the balance equation,

300,000 = 358,751 – 35,000 – Reconciliation account balance
Reconciliation account balance = 23,751

Answer is B.

## Question 19

The normal cost under the aggregate method is:

NC = (PVFB – Actuarial assets)/(PV of future salary/salary)

Since valuation results are provided as of 1/1/2005, the normal cost items for 2006 must be developed from the 2005 items.

The present value of future benefits (PVFB) must be increased with one year's valuation interest since all participants are now one year closer to retirement (it must be assumed that the inactive participants are deferred vested participants and not retirees – an assumption that makes sense since it is given that there were no benefit payments made during 2005). In addition, the active participants received a 3% salary increase in 2005 (rather than the 4% assumed, so the PVFB for those participants must be reduced accordingly.

$PVFB_{1/1/2006} = (3{,}000{,}000 \times 1.07 \times (1.03/1.04)) + (6{,}000{,}000 \times 1.07) = 9{,}599{,}135$

The actual rate of return for the assets in 2005 was 2%. The minimum required contribution was the 1/1/2005 normal cost with interest to the end of the year, and this was contributed on 12/31/2005.

2005 contribution = $182{,}000 \times 1.07 = 194{,}740$

$AVA_{1/1/2006} = (7{,}000{,}000 \times 1.02) + 194{,}740 = 7{,}334{,}740$

Since the normal retirement benefit is salary based, the amortization of the present value of future normal costs is determined as a level percent of salary. The ratio of the present value of future salary to salary can be equated to $\ddot{a}_{\overline{N}|j}$ (where j = 1.07/1.04 – 1). Using the data provided for the 2005 valuation,

$182{,}000 = (3{,}000{,}000 + 6{,}000{,}000 - 7{,}000{,}000)/\ddot{a}_{\overline{N}|j} \quad \Rightarrow \quad \ddot{a}_{\overline{N}|j} = 10.989011$

The amortization factor for 2006 can be derived from 2005 using the tabular interest rate *j* and the fact that the active participants were the same in both years. (Note that it is irrelevant to the tabular factor that the actual salary increase in 2005 was 3%.)

$\ddot{a}_{\overline{N-1}|j} = (\ddot{a}_{\overline{N}|j} - 1) \times (1.07/1.04) = 10.277156$

$NC_{1/1/2006} = (9{,}599{,}135 - 7{,}334{,}740)/10.277156 = 220{,}333$

Answer is D.

## Question 20

Recall the balance equation:

UL = Outstanding balance – Credit balance – Reconciliation account balance

In an immediate gain method (like entry age normal), the unfunded liability is equal to the accrued liability less the actuarial value of assets.

UL = 1,000,000 – 550,000 = 450,000

Substituting into the balance equation,

$450{,}000 = 500{,}000 - 2{,}000 - \text{Reconciliation account balance}_{1/1/2006}$
$\text{Reconciliation account balance}_{1/1/2006} = 48{,}000$

The reconciliation account balance as of 1/1/2007 is equal to the balance as of 1/1/2006, brought forward with valuation interest, plus any new additional funding charges or late interest charges for 2006.

$\text{Reconciliation account balance}_{1/1/2007} = (48{,}000 \times 1.07) + 1{,}000 = 52{,}360$

The answer is D.

## Question 21

The amortization bases for a multiemployer plan generally are amortized over the same number of years as a single employer plan. However, experience gains and losses for multiemployer plans are amortized over 15 years (rather than 5 for single employer plans) and assumption change bases for multiemployer plans are amortized over 30 years (rather than 10 for single employer plans).

The minimum required contribution for 2006 as of 12/31/2006 is:

$$(600{,}000 + 200{,}000/\ddot{a}_{\overline{15}|} + 150{,}000/\ddot{a}_{\overline{15}|} - 50{,}000/\ddot{a}_{\overline{15}|} + 500{,}000/\ddot{a}_{\overline{30}|} + 300{,}000/\ddot{a}_{\overline{30}|} - 120{,}000) \times 1.07$$

$$= (600{,}000 + 20{,}522 + 15{,}392 - 5{,}131 + 37{,}657 + 22{,}594 - 120{,}000) \times 1.07$$

$$= 611{,}006$$

The credit balance as of 12/31/2006 is equal to the excess of the 2006 contribution (which is given no interest credit since it was deposited on the last day of the year) over the minimum required contribution.

$CB_{12/31/2006} = 828{,}000 - 611{,}006 = 216{,}994$

Answer is D.

## Question 22

The additional funding charge applies whenever the Gateway percentage is less than 80% and there are more than 100 participants in the plan on at least one day of the prior year. The maximum number of participants in 2005 was 130, so that condition is satisfied. The Gateway percentage as of 1/1/2006 is equal to the ratio of the actuarial value of assets (unreduced by the credit balance) to the current liability determined at the highest allowable interest rate. This is:

Gateway percentage = 800,000/1,100,000 = 72.7%

Therefore, since the greatest number of participants in 2005 exceeded 100 participants and the Gateway percentage is less than 80%, the additional funding charge applies for 2006.

For purposes of determining the additional funding charge, the funded current liability percentage is equal to the ratio of the actuarial value of assets (reduced by the credit balance) to the current liability. As of 1/1/2006, this is:

62.5% = (800,000 – 50,000)/1,200,000

The unfunded current liability for purposes of the additional funding charge is equal to the current liability less the actuarial value of assets (again, reduced by the credit balance).

Unfunded current liability = 1,200,000 – (800,000 – 50,000) = 450,000

The unfunded current liability is divided into unfunded old liability, unfunded new liability, and unpredictable contingent event liability. Plans effective after 1989 (the first year that the additional funding charge rules applied) have no unfunded old liability. There is no unpredictable contingent event liability since none is given and a general condition of the exam says that there are none unless information is provided. Therefore, the unfunded new liability is equal to the entire unfunded current liability of 450,000.

The applicable percentage that applies to the unfunded new liability using the given formula is:
30% - [(62.5% - 60%) × .4]} = 0.29

The unfunded new liability amount is: 450,000 × 0.29 = 130,500

The Deficit Reduction Contribution (DRC) is equal to the sum of the unfunded old liability amount, the unfunded new liability amount and the expected increase in current liability for 2006 due to the additional accrual for the year. This is:

DRC = 130,500 + 80,000 = 210,500

This is reduced by the funding standard account items under the funding method (normal cost and amortization charges (credits)):

210,500 – (90,000 + 70,000) = 50,500

The preliminary additional funding charge is this amount increased with interest at the current liability interest rate to the end of the year:

50,500 × 1.0475 = 52,899

This must be pro-rated if the number of participants from the prior year is less than 150 (but more than 100). Since the greatest number of participants in 2005 was 130, the preliminary additional funding charge is pro-rated by 30/50.

Additional funding charge for 2006 = 52,899 × 30/50 = 31,739

The minimum required contribution for 2006 as of 12/31/2006 is:

[(90,000 + 70,000 – 50,000) × 1.07] + 31,739 + 10,000 = 159,439

Answer is D.

Note that the additional funding charge is reduced if, together with the other minimum required contributions, it would fully fund the unfunded current liability. Since the minimum funding requirement is approximately $160,000 (at the end of the year) and the unfunded current liability was $450,000 (at the beginning of the year), it is clear that this reduction does not apply. If these numbers were much closer in value, then the limitation would warrant further inspection.

## Question 23

The normal cost under the frozen initial liability method is:

NC = (PVFB – Actuarial assets – Unfunded liability)/(PV of future salary/salary)

Note that the actuarial value of the assets is not reduced by the credit balance in order to determine the normal cost under the frozen initial liability method.

The unfunded liability is not given. However, the balance equation can be used to determine the unfunded liability. Note that the outstanding balance of the bases is equal to the sum of the outstanding balance of the initial base and the amount of the new base established on 1/1/2006 due to the plan amendment.

UL = Outstanding balance – Credit balance – Reconciliation account balance
UL = 1,250,000 + 450,000 – 40,000 = 1,660,000

The normal cost as of 1/1/2006 is:

NC = (3,500,000 – 1,500,000 – 1,660,000)/(6,500,000/500,000) = 26,154

There are 20 years left to amortize the outstanding balance of the initial base (10 years have elapsed since the plan effective date). The plan amendment base is amortized over 30 years.

The minimum required contribution for 2006 as of 12/31/2006 is:

$(26{,}154 + 1{,}250{,}000/\ddot{a}_{\overline{20}|} + 450{,}000/\ddot{a}_{\overline{30}|} - 40{,}000) \times 1.07$
$= (26{,}154 + 110{,}272 + 33{,}891 - 40{,}000) \times 1.07 = 139{,}439$

Answer is C.

Note that the full funding limitation can be ignored since there is not enough information to calculate it.

## Question 24

Recall the balance equation:

UL = Outstanding balance – Credit balance – Reconciliation account balance

In an immediate gain method (like unit credit), the unfunded liability is equal to the accrued liability less the actuarial value of assets. A funding deficiency is treated as a negative credit balance for purposes of the balance equation, and is therefore added (rather than subtracted). The outstanding balance of each base is equal to the amortization charge (credit) multiplied by the present value of the future remaining payments.

$AL - 200{,}000 = (20{,}000 \times \ddot{a}_{\overline{28}|}) - (30{,}000 \times \ddot{a}_{\overline{4}|}) + (10{,}000 \times \ddot{a}_{\overline{5}|}) + 25{,}000 - 5{,}000$

$AL = 200{,}000 + 259{,}734 - 108{,}729 + 43{,}872 + 25{,}000 - 5{,}000 = 414{,}877$

Answer is D.

## Question 25

The asset gain or loss is equal to the difference between the actual actuarial value of the assets ($130,000) and the expected actuarial value of the assets. In order to develop the expected value, it is necessary to determine the contribution made for the 2005 year.

The minimum required contribution for 2005 was:

$(NC_{1/1/2005} + \text{Net amortization charges}_{1/1/2005} - \text{Credit balance}_{12/31/2004}) \times 1.07$
$= (30{,}000 - 10{,}000 - 10{,}000) \times 1.07 = 10{,}700$

Since the credit balance as of 12/31/2005 is $5,000, the contribution for 2005 must have been $5,000 more than the minimum (assuming it was paid on 12/31/2005). The contribution for 2005, then, is $15,700.

The expected actuarial value of assets as of 1/1/2006 assumes that the assets earned 7% during 2005. Interest pro-rated for the benefit payments during the year can be accumulated using either simple or compound interest. Simple interest has been used in this solution.

$\text{Expected actuarial value of assets}_{1/1/2006} = (120{,}000 \times 1.07) - (20{,}000 \times 1.035) + 15{,}700$
$= 123{,}400$

2005 asset gain = 130,000 – 123,400 = 6,600

Answer is B.

## Question 26

The quarterly contribution requirement applies if the funded current liability percentage as of the valuation date in the prior year is less than 100%. The funded current liability percentage is not given in this question for 2005, so it must be assumed that it was less than 100% or the question would be unnecessary to ask. In addition, the liquidity requirement applies since there were more than 100 participants in the prior year. See IRC section 412(m), Revenue Notice 89-52, and Revenue Ruling 95-31 for a discussion of the quarterly contribution and liquidity requirements.

The quarterly contribution requirement is equal to 25% of the smaller of the minimum funding requirement as of the last day of the prior year, or 90% of the minimum funding requirement as of the first day of the current year (end of year charges such as the additional funding charge must be discounted with valuation interest to the first day of the year). These minimums are without regard to any credit balance in the funding standard account. The minimum funding requirement for 2005 and 2006 must be developed.

Under the aggregate cost method, there is a normal cost and no unfunded liabilities. There is an additional funding charge each year. The minimum required contribution for each year (without regard for the credit balance) is:

2005 $\text{minimum}_{12/31/2005} = (100{,}000 \times 1.07) + 100{,}000 = 207{,}000$
2006 $\text{minimum}_{1/1/2006} = 120{,}000 + 120{,}000/1.07 = 232{,}150$
90% of 2006 minimum = $232{,}150 \times 90\% = 208{,}935$

The smaller of the 2005 minimum and 90% of the 2006 minimum is $207,000.

The 2006 quarterly contribution requirement is: $207{,}000 \times 25\% = 51{,}750$

The first quarterly contribution payment is due on 4/15/2006. However, if the liquidity shortfall as of 3/31/2006 exceeds $51,750, then that is the amount due on 4/15/2006.

The liquidity shortfall is equal to the excess of 3 times the adjusted disbursements over the adjusted liquid market value of assets. Disbursements are adjusted by a percentage of the non-recurring disbursements. In this question, the lump sum payments are the only non-recurring disbursements. The actual disbursements during the 12 month period ending on 3/31/2006 are adjusted by subtracting the lump sum payments multiplied by the funded current liability percentage as of the first day of 2006.

Adjusted disbursements$_{3/31/2006}$ = (70,000 + 50,000) – (70,000 × 60%) = 78,000

Since there are no advance contributions for 2006, there is no adjustment to the liquid assets. The liquidity shortfall as of 3/31/2006 is:

Liquidity shortfall$_{3/31/2006}$ = (3 × 78,000) – 160,000 = 74,000

The contribution due on 4/15/2006 is the greater of the quarterly contribution requirement or the liquidity shortfall. This is the liquidity shortfall of $74,000

Answer is E.

## Question 27

The normal cost under the frozen initial liability method is:

NC = (PVFB – Actuarial assets – Unfunded liability)/(PV of future salary/salary)
NC$_{1/1/2006}$ = (1,500,000 – 340,000 – 100,000)/(1,000,000/85,000) = 90,100

Note that it must be assumed that the unfunded accrued liability (UAL) is equal to the unfunded liability (UL). UAL technically only has meaning in an immediate gain method (not a spread gain method like FIL). However, since there is no other type of unfunded liability provided in this question, it must be assumed that the writers of this question meant to label it as UL.

It is clear that the only amortization base in this question is the initial amortization base. Using the balance equation,

UL = Outstanding balance – Credit balance – Reconciliation account balance
100,000 = Outstanding balance – 0 – 0
Outstanding balance = 100,000

There are 24 years remaining (6 years have elapsed since the 2000 effective date) to amortize the original amortization base for minimum funding purposes. The original amortization base is:

Original base = 100,000 × ( $\ddot{a}_{\overline{30}|} / \ddot{a}_{\overline{24}|}$ ) = 108,193

The deductible limit under IRC section 404(a)(1)(A) for 2006 is equal to the greater of the minimum required contribution or the normal cost plus the 10-year amortization of the initial base. Since there are no other amortization bases, it is clear that the normal cost plus the 10-year amortization of the initial base will be larger. This is:

$(90{,}100 + 108{,}193/\ddot{a}_{\overline{10}|}) \times 1.07 = (90{,}100 + 14{,}396) \times 1.07 = 111{,}811$

This must be limited by the full funding limitation. The ERISA full funding limitation (based upon the entry age normal cost method – see Revenue Ruling 81-13) is equal to the accrued liability plus normal cost, rolled forward with valuation interest to the end of the year, less the smaller of the actuarial or market value of the assets, rolled forward with valuation interest to the end of the year.

ERISA full funding limit = $(350{,}000 + 40{,}000 - 300{,}000) \times 1.07 = 96{,}300$

The overall full funding limitation is equal to the greater of the ERISA or the RPA'94 full funding limitation. The RPA'94 full funding limitation is equal to 90% of the current liability (including the expected increase in liability due to the current year accruals), rolled forward with current liability interest to the end of the year (not needed in this question since the current liability provided is as of the last day of the year), less the actuarial value of the assets, rolled forward with valuation interest to the end of the year.

RPA'94 full funding limit = $(90\% \times 515{,}000) - (340{,}000 \times 1.07) = 99{,}700$

The overall full funding limit is $99,700. This is less than the 2006 deductible limit under IRC section 404(a)(1)(A), so the deductible limit for 2006 generally cannot exceed $99,700. However, if the unfunded current liability under IRC section 404(a)(1)(D) is larger, that can be deducted.

$UCL_{12/31/2006} = 515{,}000 - (340{,}000 \times 1.07) = 151{,}200$

The deductible limit for 2006 is $151,200.

Answer is D.

## Question 28

The liability experience gain or loss is equal to the difference between the expected and actual liabilities. For the inactive participants, the expected liability is equal to the prior year liability rolled forward with interest, reduced by the benefit payments (with no interest adjustment for the benefit payments since they were made on the last day of the year).

Expected liability (inactive)$_{1/1/2006}$ = (750,000 × 1.07) – 50,000 = 752,500

Experience loss for inactive participants = 800,000 – 752,500 = 47,500

The expected liability for the active participants is equal to the present value of the accrued benefit as of 1/1/2006 based upon the participant data as of 1/1/2005. Note that there is no pre-retirement decrement assumption, so the assumption is that all active participants as of 1/1/2005 would continue to be active as of 1/1/2006. All participants have an additional year of service since 1/1/2005.

Expected liability for active Group 1$_{1/1/2006}$

$= \$10 \times 21 \text{ years of service} \times 100 \text{ participants} \times 12\,\ddot{a}_{65}^{(12)} \times v^{14}$

$= 21{,}000 \times 12 \times 9.24 \times 0.387817 = 903{,}024$

Expected liability for active Group 2$_{1/1/2006}$

$= \$10 \times 16 \text{ years of service} \times 100 \text{ participants} \times 12\,\ddot{a}_{65}^{(12)} \times v^{19}$

$= 16{,}000 \times 12 \times 9.24 \times 0.276508 = 490{,}547$

Total expected liability (active)$_{1/1/2006}$ = 903,024 + 490,547 = 1,393,571

The actual liability for the active participants is equal to the present value of the accrued benefit as of 1/1/2006 based upon the participant data as of 1/1/2006.

Actual liability for active Group 1$_{1/1/2006}$

$= \$10 \times 21 \text{ years of service} \times 90 \text{ participants} \times 12\,\ddot{a}_{65}^{(12)} \times v^{14}$

$= 18{,}900 \times 12 \times 9.24 \times 0.387817 = 812{,}722$

Actual liability for active Group 2$_{1/1/2006}$

$= \$10 \times 16 \text{ years of service} \times 80 \text{ participants} \times 12\,\ddot{a}_{65}^{(12)} \times v^{19}$

$= 12{,}800 \times 12 \times 9.24 \times 0.276508 = 392{,}438$

Total actual liability (active)$_{1/1/2006}$ = 812,722 + 392,438 = 1,205,160

Experience gain for active participants = 1,393,571 – 1,205,160 = 188,411

The net liability gain for 2005 is equal to the difference between the active participant gain and the inactive participant loss.

2005 liability gain = 188,411 – 47,500 = 140,911

Answer is C.

## Question 29

There is no normal cost under the unit credit method when benefit accruals have been frozen. The minimum funding requirement is equal to the total of the net amortization charges less the credit balance. The outstanding balance has been provided for all prior amortization bases. However, there may be a 2005 gain or loss, so the balance equation must be used to determine that. This is determined using the old interest rate of 8%. Note that in an immediate gain method (such as unit credit) the unfunded liability is equal to the accrued liability less the actuarial value of the assets.

UL = Outstanding balance – Credit balance – Reconciliation account balance
510,000 – 375,000 = (147,000 + 2,600 + 5,500 + 1,100 + 2005 loss (gain)) – 5,000
2005 gain = 16,200

There is also a new amortization base as of 1/1/2006 due to the change in the valuation interest rate from 8% to 7%. This new base is equal to the difference between the accrued liability at the new 7% rate and the accrued liability at the old 8% rate.

Assumption change base = 550,000 – 510,000 = 40,000

The outstanding balance of each amortization base is amortized at the new 7% interest rate over the remaining period for IRC section 412.

The minimum funding requirement for 2006 as of 12/31/2006 is:

$$(147{,}000/\ddot{a}_{\overline{19}|.07} + 2{,}600/\ddot{a}_{\overline{2}|.07} + 5{,}500/\ddot{a}_{\overline{3}|.07} + 1{,}100/\ddot{a}_{\overline{4}|.07} - 16{,}200/\ddot{a}_{\overline{5}|.07} + 40{,}000/\ddot{a}_{\overline{10}|.07} - 5{,}000) \times 1.07$$

$$= (13{,}292 + 1{,}344 + 1{,}959 + 304 - 3{,}693 + 5{,}323 - 5{,}000) \times 1.07 = 14{,}476$$

Answer is C.

## Question 30

The asset experience gain or loss for 2005 is equal to the difference between the expected and actual asset values as of 1/1/2006.

The expected actuarial value of assets is equal to the prior year actuarial assets, rolled forward with valuation interest, reduced by the benefit payments (with no interest adjustment for the benefit payments since they were made on the last day of the year). Note that no contribution was made for 2005.

Expected actuarial value of $\text{assets}_{1/1/2006} = (2{,}775{,}000 \times 1.07) - 50{,}000 = 2{,}919{,}250$

The actuarial value of the assets as of 1/1/2006 is based upon the smoothed value method with a 4-year smoothing period. The smoothed value method described in section 3.15 of Revenue Procedure 2000-40 states that when a 4-year smoothing period is used, the market value of assets as of a valuation date are adjusted by 3/4 of the asset gain or loss from the prior year, 2/4 of the asset gain or loss from the second prior year, and 1/4 of the asset gain or loss from the third prior year. Losses are added to and gains are subtracted from the market value of assets.

The asset gains and losses for 2003 and 2004 have been provided. The asset gain or loss for 2005 can be determined by comparing the expected market value of assets at the end of 2005 with the actual market value at the end of 2005. Note that interest is pro-rated for transactions that occur during the year. The pro-ration can be done using either simple or compound interest (simple interest will be used in this solution). Note that actual earnings are irrelevant to the determination of the expected assets.

Expected $\text{market value}_{12/31/2005} = (2{,}750{,}000 \times 1.07) - 50{,}000 = 2{,}892{,}500$

2005 asset gain = 2,900,000 – 2,892,500 = 7,500

1/1/2006 smoothed value = 2,900,000 - (3/4 × 7,500)
- (2/4 × 25,000) + (1/4 × 50,000) = 2,894,375

The 1/1/2006 smoothed value must be must be adjusted if it is not within 20% of the market value (it is within 20% in this case). The loss in the actuarial value of the assets for 2005 is equal to the difference between the expected and actual actuarial value of the assets.

2005 actuarial asset loss = 2,919,250 - 2,894,375 = 24,875

Answer is E.

## Question 31

The gain or loss due to a participant retiring before the assumed retirement age is equal to the difference between the actual liability and the accrued liability under the cost method had the participant not retired.

The monthly benefit payable upon the retirement of the participant is:

\$50 × 28 years of service × 80% due to 4-year reduction for early retirement = \$1,120

The actual liability is: $\$1{,}120 \times 12\,\ddot{a}_{61}^{(12)} = 153{,}350$

The accrued liability in the unit credit cost method is equal to the present value of the accruals for prior years. Based upon the given benefit formula, monthly prior year accruals as of 1/1/2006 are:

\$50 × 28 years of service = \$1,400

Using the retirement rates assumed as of 1/1/2006, 50% of all retirements are assumed to occur at age 61, and the remaining 50% of all retirements are assumed to occur at age 62. Under this assumption, the accrued liability can be calculated as being equal to the sum of the present value of the past service accrual payable at each possible retirement age, adjusted for the probability of retirement at that age.

Early retirement reduction at age 61 = 5% × 4 years = 20%
Early retirement reduction at age 62 = 5% × 3 years = 15%

$$AL_{1/1/2006} = (1{,}400 \times (1 - 0.20) \times 12\,\ddot{a}_{61}^{(12)} \times 50\%) + (1{,}400 \times (1 - 0.15) \times 12\,\ddot{a}_{62}^{(12)} \times v \times 50\%)$$
$$= 76{,}675 + 74{,}937 = 151{,}612$$

The loss is equal to the difference between the actual liability and the expected accrued liability.

Loss = 153,350 – 151,612 = 1,738

Answer is B.

## Question 32

The amortization bases for IRC section 404 are re-established when the fresh start approach is used. In an immediate gain method (such as entry age normal), the re-established amortization base is equal to the unfunded accrued liability. (See IRS regulation 1.404(a)-14(i)(5) for a description of the fresh start alternative.)

The unfunded accrued liability is equal to the difference between the accrued liability and the actuarial value of the assets. When there are undeducted contributions, the undeducted contribution must be subtracted from the actuarial value of the assets.

IRC section 404 actuarial assets = 14,500 – 1,500 = 13,000

Unfunded accrued liability = 23,000 – 13,000 = 10,000

The fresh start base of $10,000 is amortized over 10 years for IRC section 404. The deductible limit under IRC section 404(a)(1)(A)(iii) is equal to the normal cost plus the 10-year amortization of the IRC section 404 bases.

IRC section 404(a)(1)(A)(iii) deductible limit for 2006 $= (1{,}000 + 10{,}000/\ddot{a}_{\overline{10}|}) \times 1.07$

$= (1{,}000 + 1{,}331) \times 1.07$

$= 2{,}494$

IRC section 404(a)(1)(D) provides that the unfunded current liability can be deducted if that is larger than the deductible limit under IRC section 404(a)(1)(A). The current liability is provided as of the end of the year. The actuarial assets must be increased with interest to the end of the year. However, since undeducted contributions are not credited with interest, the assets must be increased with interest before the undeducted contributions are subtracted.

Unfunded current liability = Current liability – Actuarial value of assets

$= 27{,}500 – [(14{,}500 \times 1.07) – 1{,}500] = 13{,}485$

The deductible limit is equal to the unfunded current liability of 13,485

Answer is C.

Note: The deductible limit under IRC section 404(a)(1)(A) is technically equal to the greater of the normal cost plus the 10-year amortization of the IRC section 404 bases or the minimum funding requirement. However, there is not enough information to calculate the minimum funding requirement, so it can be ignored. In addition, the deductible limit under IRC section 404(a)(1)(A) is subject to the IRC section 404 full funding limit. This can be ignored since the unfunded current liability is not subject to the full funding limit.

## Question 33

The normal cost under the entry age normal method is based upon annual normal costs beginning at hire age. The present value of future benefits at hire age must be determined based upon the projected retirement benefit.

$PVFB_{61} = 1{,}200 \times 12\,\ddot{a}_{65}^{(12)} \times v^4 = 1{,}200 \times 12 \times 9.42 \times 0.762895 = 103{,}485$

The normal cost is determined as a level percentage of salary (since the retirement benefit is salary related). So, an implicit interest rate ($j$) must be used based upon the ratio of the valuation interest rate to the salary scale.

$j = (1.07/1.04) - 1 = 2.884615$

The normal cost at entry age 61 is:

$NC_{61} = 103{,}485/\ddot{a}_{\overline{4}|j} = 103{,}485/3.834898 = 26{,}985$

The normal cost at the participant's attained age of 62 must be 4% larger than the normal cost at age 61 because the normal cost increases as salary increases.

$NC_{62} = 26{,}985 \times 1.04 = 28{,}064$

Answer is B.

## Question 34

The ERISA full funding limitation (based upon the unit credit cost method since it is an immediate gain method – see Revenue Ruling 81-13) is equal to the accrued liability plus normal cost, rolled forward with valuation interest to the end of the year, less the smaller of the actuarial or market value of the assets (reduced by the credit balance), rolled forward with valuation interest to the end of the year.

ERISA full funding limit = (1,000,000 + 25,000 – 900,000) × 1.07 = 133,750

The overall full funding limitation is equal to the greater of the ERISA or the RPA'94 full funding limitation. The RPA'94 full funding limitation is equal to 90% of the current liability (including the expected increase in liability due to the current year accruals), rolled forward with current liability interest to the end of the year (not needed in this question since the current liability provided is as of the last day of the year), less the actuarial value of the assets (unreduced by the credit balance), rolled forward with valuation interest to the end of the year.

RPA'94 full funding limit = (90% × 1,303,800) – (900,000 × 1.07) = 210,420

The overall full funding limit is $210,420.

Answer is D.

## Question 35

The normal cost under the unit credit method is equal to the present value of the benefit accrual for the current year, based upon salary projected to retirement. The sole participant has 20 years of past service, so the benefit accrual for 2006 is based upon 4% of final three-year average compensation.

$$\text{Final 3-year average compensation} = \$35{,}000 \times \frac{1.03^3 + 1.03^4 + 1.03^5}{3} = \$39{,}404$$

$$NC_{1/1/2006} = 4\% \times 39{,}404 \times \ddot{a}_{65}^{(12)} \times v^5 = 1{,}576.16 \times 9.70 \times 0.712986 = 10{,}901$$

Answer is E.

## Question 36

In order to determine the minimum required contribution for 2006, it is necessary to determine the outstanding balance of the amortization bases under the frozen liability method. Since there is no information about other bases such as those arising from assumption changes or plan amendments, the only amortization base is the initial base established upon the effective date of the plan.

The unfunded liability can be determined from the determination of the 2006 normal cost.

NC = (PVFB – Actuarial assets – UL)/(PVFS/Salary)
100,000 = (1,800,000 – 500,000 – UL)/(2,000,000/250,000)
UL = 500,000

Note that the credit balance is not subtracted from the actuarial assets for purposes of the normal cost calculation in the frozen initial liability method.

The outstanding balance can be determined using the balance equation.

UL = Outstanding balance – Credit balance – Reconciliation account balance
500,000 = Outstanding balance – 25,000
Outstanding balance = 525,000

Since the plan was effective in 1994, there are 18 years left to amortize the initial base.

The minimum required contribution for 2006 as of 12/31/2006 is:

$(100{,}000 + 525{,}000/\ddot{a}_{\overline{18}|} - 25{,}000) \times 1.07 = ((100{,}000 + 48{,}777 - 25{,}000) \times 1.07 = 132{,}441$

Answer is D.

Note that the full funding limitation can be ignored since there is not enough information to determine it.

## Question 37

The outstanding balance of each amortization base in existence prior to the change in the valuation interest rate for the 2006 valuation is re-amortized over the remaining years at the new interest rate. The outstanding balance must be determined for each of the amortization bases that applied to the 2005 valuation. This is based upon the interest rate before 2006 of 7.5%. Recall that the amortization period for initial and assumption change bases is 30 years for multiemployer plans, and the amortization period for experience gain/loss bases is 15 years for multiemployer plans.

$$\text{Outstanding balance of initial base}_{1/1/2006} = 195{,}000 \times \ddot{a}_{\overline{28}|.075}$$
$$= 195{,}000 \times 12.441381 = 2{,}426{,}069$$
$$\text{Outstanding balance of assumption change base}_{1/1/2006} = 30{,}000 \times \ddot{a}_{\overline{29}|.075}$$
$$= 30{,}000 \times 12.573378 = 377{,}201$$
$$\text{Outstanding balance of 2004 gain base}_{1/1/2006} = 60{,}000 \times \ddot{a}_{\overline{14}|.075}$$
$$= 60{,}000 \times 9.125840 = 547{,}550$$

The increase in the minimum required contribution for 2006 as of 1/1/2006 due to the change in interest rate is equal to the increase in the normal cost plus the increase (decrease) in amortization charges (credits), including the 2005 experience loss, plus the amortization of the increase in accrued liability due to the change in interest rate.

$$\text{Increase}_{1/1/2006} = 30{,}000 + \frac{200{,}000}{\ddot{a}_{\overline{30}|.07}} + \left(\frac{2{,}426{,}069}{\ddot{a}_{\overline{28}|.07}} - 195{,}000\right) + \left(\frac{377{,}201}{\ddot{a}_{\overline{29}|.07}} - 30{,}000\right)$$
$$- \left(\frac{547{,}550}{\ddot{a}_{\overline{14}|.07}} - 60{,}000\right) + \left(\frac{100{,}000}{\ddot{a}_{\overline{15}|.07}} - \frac{100{,}000}{\ddot{a}_{\overline{15}|.075}}\right)$$
$$= 30{,}000 + 15{,}063 + (186{,}812 - 195{,}000) + (28{,}713 - 30{,}000)$$
$$- (58{,}514 - 60{,}000) + (10{,}261 - 10{,}538)$$
$$= 36{,}797$$

Answer is C.

## Question 38

The quarterly contribution requirement is equal to 25% of the smaller of the minimum funding requirement as of the last day of the prior year, or 90% of the minimum funding requirement as of the first day of the current year. These minimums are without regard to any credit balance in the funding standard account. The minimum funding requirement for 2005 must be developed (there is only a normal cost for 2006, and that is given as of the first day of the year).

Under the aggregate cost method, there is a normal cost and no unfunded liabilities. There is an additional funding charge in 2005. The minimum required contribution for 2005 (without regard for the credit balance) is:

$2005\ \text{minimum}_{12/31/2005} = (250{,}000 \times 1.07) + 50{,}000 = 317{,}500$
$\text{Credit balance}_{12/31/2005} = 350{,}000 - 317{,}500 = 32{,}500$

90% of 2006 minimum = $280{,}000 \times 90\% = 252{,}000$

The smaller of the 2005 minimum and 90% of the 2006 minimum is $252,000.

The 2006 quarterly contribution requirement is: $252{,}000 \times 25\% = 63{,}000$

The first quarterly contribution payment is due on 4/15/2006. This can partially be paid by using the credit balance as of 12/31/2005. The credit balance can be rolled forward with valuation interest at the valuation interest rate. See Revenue Notice 89-52, Q&A 12.

$\text{CB as of } 4/15/2006 = 32{,}500 \times 1.07^{3.5/12} = 32{,}500 \times 1.019930 = 33{,}148$

Minimum amount payable on 4/15/2006 = 63,000 – 33,148 = 29,852

Answer is A.

Note that the interest credited to the credit balance could be credited using simple interest rather than compound interest. Compound interest has been used in this solution to be consistent with the examples in Revenue Notice 89-52. However, there is no requirement in the notice to use compound interest.

## Question 39

The contribution to the IRC section 404 bases is generally equal to the deduction for the year less the normal cost as of the end of the year (see IRS regulation 1.404(a)-14(h)(6)). Note that there is an adjustment when there are contribution carryovers (there are none in this question) or contributions made before the end of the year (again, this does not apply to this question).

It can be assumed that the contribution for 2006 was deducted (since it was made by the due date of the employer's tax return for 2006 and would appear not to exceed the deductible limit – there is insufficient information to exactly determine the deductible limit).

Contribution to IRC section 404 bases for 2006 = 20,000 – (10,000 × 1.07) = 9,300

The contribution to the IRC section 404 bases is made in proportion to the 10-year amortization of the bases ((see IRS regulation 1.404(a)-14(h)(4)). It can be assumed that the limit adjustment provided is equal to the 10-year amortization, since it is less than the given outstanding balance of each base. The total 10-year amortization of the two bases is $15,000.

It should be noted that the terminology used in this question is not the best, since outstanding balance generally is used with regard to the IRC section 412 balance that is noted on the schedule B. It is clear that in this question, the exam writers intended for "outstanding balance" to mean "unamortized balance" as defined in IRS regulation 1.404(a)-14.

The allocation of the 2006 contribution to the assumption change base is:

$$9{,}300 \times \frac{(15{,}000)}{15{,}000} = (9{,}300)$$

Note that the contribution allocated is as of the end of the 2006 year.

The outstanding balance ("unamortized balance") of the assumption change base is equal to the 1/1/2006 outstanding balance, increased with valuation interest to the end of the year, and reduced by the contribution allocation.

Outstanding balance$_{1/1/2007}$ = ((50,000) × 1.07) – (9,300) = (44,200)

Answer is D.

## Question 40

A mortality gain or loss is equal to the difference between the actual liability taking into account the actual mortality and the expected liability under the cost method had the mortality followed the actuarial assumptions.

In this case, there is no death benefit, so the actual liability is \$0.

Since Smith retired on 1/1/2006, the expected liability is the liability that the plan would have had if Smith had followed the assumed mortality.

$$\text{Expected liability}_{12/31/2006} = \$500 \times 30 \text{ years of service} \times \ddot{a}_{66} \times {}_{1}p_{65}$$
$$= 15{,}000 \times 9.46 \times (1 - 0.0153) = 139{,}729$$

There is a gain of 139,729.

Answer is C.

## Question 41

The quarterly contribution requirement is equal to 25% of the smaller of the minimum funding requirement as of the last day of the prior year, or 90% of the minimum funding requirement as of the first day of the current year. These minimums are without regard to any credit balance in the funding standard account. The minimum required contribution for 2005 as of 12/31/2005 is given as \$750,000. The minimum required contribution for 2006 as of 12/31/2006 is given as \$562,500. This must be discounted with interest at 7% to the first day of the year.

$$\text{2006 minimum}_{1/1/2006} = \$562{,}500/1.07 = 525{,}701$$

Since 2005 was the first year of the plan, there was no credit balance on 1/1/2005. However, since the 2005 contribution of \$1,000,000 exceeded the minimum, there is a credit balance as of 12/31/2005.

$$CB_{12/31/2005} = \$1{,}000{,}000 - \$750{,}000 = \$250{,}000$$

Since for purposes of the quarterly contribution requirement the minimum contributions are determined without regard to the credit balance, the 2006 minimum as of 1/1/2006 must be adjusted by adding back the credit balance.

2006 minimum without CB = \$525,701 + \$250,000 = \$775,701

90% of 2006 minimum without CB = $775,701 × 90% = $698,131

The quarterly contribution requirement for 2006 is based upon 90% of the 2006 minimum, since that is less than the 2005 minimum.

2006 Quarterly Contribution = 25% × $698,131 = $174,533

The credit balance can be used to pay for the quarterly contributions. The credit balance can be rolled forward with valuation interest at the valuation interest rate. See Revenue Notice 89-52, Q&A 12.

CB as of 4/15/2006 = $250{,}000 \times 1.07^{3.5/12} = 250{,}000 \times 1.019930 = 254{,}982$

Remaining credit balance on 4/15/2006 = 254,982 – 174,533 = 80,449

The remaining credit balance can be rolled forward with interest to the next quarterly contribution date of 7/15/2006.

CB as of 7/15/2006 = $80{,}449 \times 1.07^{3/12} = 80{,}449 \times 1.017058 = 81{,}821$

Minimum amount payable on 7/15/2006 = 174,533 – 81,821 = 92,712

Answer is B.

Note that the interest credited to the credit balance could be credited using simple interest rather than compound interest. Compound interest has been used in this solution to be consistent with the examples in Revenue Notice 89-52. However, there is no requirement in the notice to use compound interest.

## Question 42

I. The amount of the contribution under the FIL cost method has no effect on the normal cost. This is because there are two items subtracted from the Present Value of Future Benefits (PVFB) in determining the normal cost – Actuarial Value of Assets (AVA) and Unfunded Liability (UL). The AVA is increased by the contributions made, and the UL is decreased by the contributions made. So, each item is changed *in the opposite direction* by the contributions. This means that the contribution balances itself out of the equation, and has no impact on the normal cost. Statement is false.

II. The amount of the investment earnings only has an effect on the AVA. So, unlike statement I, there is no offsetting amount. Therefore, the amount of the investment earnings *does* have an effect on the FIL normal cost. Statement is true.

III. Under the aggregate cost method, the credit balance is subtracted from the AVA. Therefore, although an additional contribution above the minimum required is deposited on 1/1/2006 for the 2005 year and is included in the AVA as of 1/1/2006, it creates a credit balance which is then subtracted from the AVA for purposes of the 2006 normal cost. Therefore, the amount of the contribution made 1/1/2006 has no impact on the 2006 normal cost. Statement is false.

Answer is C.

## Question 43

The normal cost under the individual level premium method is determined beginning at the time a participant first enters a plan (funded from that date to retirement). Plan amendments increasing (or decreasing) benefits result in increased (decreased) normal costs that are funded from the valuation date when the amendment is recognized until retirement. The individual level premium method has no initial past service liability.

The normal cost for the sole participant determined on the first valuation date of 1/1/2005 is:

$NC_{1/1/2005}$ = \$50 × 20 years of service × $12\ddot{a}_{65}^{(12)} \times v^{15} \div \ddot{a}_{\overline{15}|}$

= \$1,000 × 12 × 9.87 × 0.362446 ÷ 9.745468 = 4,405

2005 minimum = 4,405 × 1.07 = 4,713

Since there was no gain or loss during 2005, the 2006 minimum consists only of the normal cost (there is no credit balance since the minimum was contributed for 2005). There is an increase in normal cost due to the increase in the benefit formula of \$X per month. This is funded over the remaining 14 years for the sole participant. Since the 2006 minimum is equal to 125% of the 2005 minimum, the increased normal cost must be equal to 25% of the 2005 normal cost.

Increase in normal cost = 25% × 4,405 = 1,101

Increase in normal cost = \$X × 20 years of service × $12\ddot{a}_{65}^{(12)} \times v^{14} \div \ddot{a}_{\overline{14}|}$

= \$X × 20 × 12 × 9.87 × 0.387817 ÷ 9.357651 = \$X × 98.172171

\$X × 98.172171 = 1,101
\$X = 11.21

Answer is C.

## Question 44

Under the unit credit method, the normal cost is equal to the present value of the current year accrual (using final compensation projected with the salary scale) and the accrued liability is equal to the present value of the past year accruals (using final compensation projected with the salary scale). The participant has 10 years of past service as of 1/1/2006, so the entire accrued liability is based upon the 1% portion of the benefit formula. The normal cost (determined using the new valuation interest rate of 6%) is based upon the 1.25% portion of the formula since the participant is in their 11th year of service.

$$NC_{1/1/2006} = 1.25\% \times \$100{,}000 \times 1.025^{25} \times \ddot{a}^{(12)}_{65(6\%)} \times v^{25}_{6\%}$$
$$= 1.25\% \times \$100{,}000 \times 1.853944 \times 11 \times 0.232999$$
$$= 5{,}940$$

The only participant was hired on the plan effective date of 1/1/1996. Therefore, there was no initial past service liability. There have been no gains or losses, so there were no amortization bases prior to 2006. A new amortization base (amortized over 10 years) must be created due to the change in actuarial assumptions as of 1/1/2006. This is equal to the difference between the accrued liability under the new assumptions and the accrued liability under the old assumptions.

$$\text{Old } AL_{1/1/2006} = 1\% \times 10 \text{ years of service} \times \$100{,}000 \times 1.03^{25} \times \ddot{a}^{(12)}_{65(7\%)} \times v^{25}_{7\%}$$
$$= 1\% \times 10 \text{ years of service} \times \$100{,}000 \times 2.093778 \times 10 \times 0.184249$$
$$= 38{,}578$$

$$\text{New } AL_{1/1/2006} = 1\% \times 10 \text{ years of service} \times \$100{,}000 \times 1.025^{25} \times \ddot{a}^{(12)}_{65(6\%)} \times v^{25}_{6\%}$$
$$= 1\% \times 10 \text{ years of service} \times \$100{,}000 \times 1.853944 \times 11 \times 0.232999$$
$$= 47{,}516$$

New amortization base = 47,516 – 38,578 = 8,938

The minimum required contribution for 2006 as of 12/31/2006 is:

$$(5{,}940 + 8{,}938/\ddot{a}_{\overline{10}|.06}) \times 1.06 = (5{,}940 + 1{,}146) \times 1.06 = 7{,}511$$

Answer is E.