Solutions to EA-2(A) Examination
Fall, 2003

Question 1

IRS regulation 1.412(c)(1)-2(a)(2) describes the eligibility requirements for an employer to elect to use the shortfall funding method. There are two requirements. First, the plan must be collectively bargained. Second, the contributions to the plan must be made at a rate specified in the bargaining agreement. Therefore, collectively bargained plans that do not meet the second requirement may not elect to use the shortfall method. The statement is false.

Answer is B.

Question 2

In general, the normal cost under the entry age normal method is greater than the normal cost under unit credit. The exception to this general rule is the case where the plan participant is relatively close to retirement. In this question, the sole plan participant is age 30, and the normal cost will clearly be greater under the entry age normal method.

Comparing the calculation of the normal cost under each method can prove this.

$NC_{\text{Unit credit}} = \$30 \times 12\,\ddot{a}_{65}^{(12)} \times v^{35} = 33.7187\,\ddot{a}_{65}^{(12)}$

$NC_{\text{Entry age normal}} = \$30 \times 35 \text{ years} \times 12\,\ddot{a}_{65}^{(12)} \times v^{35} \div \ddot{a}_{\overline{35}|} = 85.1849\,\ddot{a}_{65}^{(12)}$

Since $85.1849\,\ddot{a}_{65}^{(12)} > 33.7187\,\ddot{a}_{65}^{(12)}$, the statement is true.

Answer is A.

Question 3

IRS regulation 1.412(c)(1)-1(b) states that each specific method of computation used in applying a cost method is part of the method. Section 2.02 of Revenue Procedure 2000-40 states that, as an example of this, the date that the assets of a plan are valued is considered a part of the funding method. Therefore, it is true that a change in this date would be considered a change in the funding method.

Answer is A.

Question 4

This question requires funding of the death benefit through a one-year term cost. A one-year term cost is equal to the present value of the death benefits to be paid on account of deaths that occur during the year. The amount of death benefit payable to the beneficiary of a single participant is clearly $20,000. The amount of death benefit payable to the beneficiary of a married participant is $500 per month. Deaths are assumed to occur at the end of the year, and spouses are assumed to be the same age as the participant. The benefit would begin to the spouse at age 65 (the spouse's age at the end of the year). This benefit has a value (as of the date that the benefit is first paid) of:

$\$500 \times 12\,\ddot{a}_{65}^{(12)} = \$60{,}000$

Of the 100 plan participants, it is assumed that 60 are married, and 40 are assumed to be single (since it is assumed that 60% of the participants are married). There is a 4% probability of death at age 64.

The present value of the death benefit for the single participants who die while age 64 is:

40 participants $\times$ \$20,000 $\times$ v $\times$ 4% = \$29,907

The present value of the death benefit for the married participants who die while age 64 is:

60 participants $\times$ \$60,000 $\times$ v $\times$ 4% = \$134,579

The total present value (normal cost for the death benefit) is:

NC = \$29,907 + \$134,579 = \$164,486

Answer is B.

Question 5

The outstanding balance of the initial amortization base as of 1/1/2003 must be re-amortized using the new 7% interest rate over the remaining 26 years (since 4 years have elapsed since the plan effective date). The balance equation can be used to determine the outstanding balance:

$$\begin{aligned}\text{Unfunded liability} &= \text{Outstanding balance} - \text{Credit balance} \\ &\quad - \text{Reconciliation account balance} \\ 325{,}000 &= \text{Outstanding balance} - 2{,}500 \\ \text{Outstanding balance} &= 325{,}000 + 2{,}500 = 327{,}500\end{aligned}$$

A new amortization base due to the change in interest rate is established equal to the increase in the unfunded liability due to the interest rate change. This base is amortized over 10 years. The new base is:

$$450{,}000 - 325{,}000 = 125{,}000$$

The minimum required contribution for 2003 is:

$$\begin{aligned}&(40{,}000 + 327{,}500/\ddot{a}_{\overline{26}|.07} + 125{,}000/\ddot{a}_{\overline{10}|.07} - 2{,}500) \times 1.07 \\ &= (40{,}000 + 25{,}882 + 16{,}633 - 2{,}500) \times 1.07 = 85{,}616\end{aligned}$$

Since \$90,000 was contributed on the last day of the year, the credit balance as of 12/31/2003 is:

$$CB_{12/31/2003} = 90{,}000 - 85{,}616 = 4{,}384$$

Answer is B.

Question 6

The normal retirement date for the participant is 1/1/2017 (at age 65). The final year that the participant will receive salary is 2016. The 2002 compensation must be projected with salary increases to 2014, 2015, and 2016.

$$\text{Final average salary} = \$60{,}000 \times \frac{1.04^{12} + 1.04^{13} + 1.04^{14}}{3} = \$99{,}955$$

The normal cost under the unit credit method is equal to the present value of the benefit accrual for the current year (using final average salary). This is:

$$NC_{1/1/2003} = 2\% \times 99{,}955 \times \ddot{a}_{65}^{(12)} \times v^{14} = 2\% \times 99{,}955 \times 10 \times .387817 = 7{,}753$$

The accrued liability under the unit credit method is equal to the present value of the benefit accruals for past years (using final average salary). Since the participant had 5 years of past service as of the plan effective date, this would be equal to 5 times the 2002 normal cost.

$$\text{Initial accrued liability}_{1/1/2002} = 6{,}280 \times 5 \text{ years} = 31{,}400$$

The experience gain or loss must be determined for 2002. Since the initial contribution was contributed at the end of 2002, there are no asset gains or losses. Therefore, any gain or loss is the result of a difference in the actual accrued liability from the expected accrued liability.

$$\text{Expected accrued liability}_{1/1/2003} = (\text{Accrued liability}_{1/1/2002} + \text{Normal cost}_{1/1/2002}) \times 1.07$$
$$= (31{,}400 + 6{,}280) \times 1.07 = 40{,}318$$
$$\text{Actual accrued liability}_{1/1/2003} = 7{,}753 \times 6 \text{ years} = 46{,}518$$
$$\text{2002 loss} = 46{,}518 - 40{,}318 = 6{,}200$$

The initial accrued liability is amortized over 30 years, and the experience loss is amortized over 5 years. Since the minimum required contribution was made for 2002, there is no credit balance in the funding standard account as of the end of 2002.

The minimum required contribution for 2003 as of 1/1/2003 is:

$$7{,}753 + 31{,}400/\ddot{a}_{\overline{30}|} + 6{,}200/\ddot{a}_{\overline{5}|} = 7{,}753 + 2{,}365 + 1{,}413 = 11{,}531$$

Answer is E.

Note: There are shortcuts that can be used to produce the 2003 normal cost and 2002 loss more quickly. Note that the expected 2002 compensation was \$52,000 (\$50,000 × 1.04). Since unit credit normal cost increases each year by the annual rate of assumed interest (when there are no gains or losses), and the compensation increased to \$60,000 rather than the expected \$52,000, the 2003 normal cost could have been determined as follows:

$$NC_{1/1/2003} = 6{,}280 \times 1.07 \times (60{,}000/52{,}000) = 7{,}753$$

In addition, the loss was due entirely to the increase in salary above what was expected. The salary increased by an extra \$8,000. Therefore, the loss is equal to the expected accrued liability multiplied by the percentage that the salary increased above what was expected. This is:

$$\text{2002 Loss} = 40{,}318 \times (8{,}000/52{,}000) = 6{,}203$$

Question 7

The credit balance in the funding standard account as of 12/31/2002 is equal to the excess of the contributions (with interest from the date of deposit to 12/31/2002) over the minimum required contribution as of 12/31/2002. Note that interest can be pro-rated for the year using either simple or compound interest. Compound interest will be used in this solution. Contributions received on or after 12/31/2002 receive no interest.

$$CB_{12/31/2002} = (100{,}000 \times 1.07^{9/12}) + (70{,}000 \times 1.07^{3/12}) + 30{,}000 - 200{,}000 = 6{,}399$$

The credit balance in the funding standard account as of 12/31/2003 is equal to the excess of the sum of the contributions (with interest from the date of deposit to 12/31/2003) and the 12/31/2002 credit balance with interest to 12/31/2003 over the 2003 normal cost with interest 12/31/2003.

$$CB_{12/31/2003} = (120{,}000 \times 1.07^{9/12}) + (60{,}000 \times 1.07^{4/12}) + 50{,}000 + 40{,}000 + (6{,}399 \times 1.07) - (210{,}000 \times 1.07) = 59{,}762$$

Answer is E.

Question 8

There was no gain or loss in 2002 from sources other than investments. Therefore, the experience gain or loss for 2002 would be the investment experience for 2002.

The expected unfunded accrued liability is equal to the expected accrued liability less the expected assets. The expected accrued liability can be developed by determining the normal cost and accrued liability as of 1/1/2002. The normal cost under unit credit is equal to the present value of the current year accrual (in this case, the 2002 accrual) using salary projected to retirement. Note that normal retirement age in this question is age 63. The participant will reach normal retirement age on 1/1/2031, so the final compensation will be paid in 2030. That equates to 29 years of future salary increases.

$NC_{1/1/2002} = 2.5\% \times \$42{,}000 \times 1.03^{29} \times \ddot{a}_{63}^{(12)} \times v^{29} = 3{,}207$

The accrued liability under unit credit is equal to the present value of the past accruals using salary projected to retirement. Since there are 9 years of past service as of 1/1/2002, the accrued liability is:

$AL_{1/1/2002} = NC_{1/1/2002} \times 9 = 3{,}207 \times 9 = 28{,}863$

The expected accrued liability as of 1/1/2003 is:

Expected $AL_{1/1/2003} = (AL_{1/1/2002} + NC_{1/1/2002}) \times 1.07 = (28{,}863 + 3{,}207) \times 1.07 = 34{,}315$

The expected assets as of 1/1/2003 (using compound interest, although simple interest can also be used) is:

Expected $\text{assets}_{1/1/2003} = 7{,}000 \times 1.07^{9/12} = 7{,}364$

Expected unfunded accrued $\text{liability}_{1/1/2003} = 34{,}315 - 7{,}364 = 26{,}951$

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

Loss = 28,000 – 26,951 = 1,049

Answer is D.

Question 9

A plan is exempt from the quarterly contribution requirement if the funded current liability percentage for the preceding plan year is at least 100%. The funded current liability percentage is determined as of the valuation date in the preceding year, and is equal to the ratio of the actuarial assets (unreduced by the credit balance) to the RPA'94 current liability (not including the expected increase in current liability due to the preceding year's benefit accrual). See Revenue Ruling 95-31, Q&A 3 – 5. Based upon this definition, the funded current liability percentage to be used to determine whether the quarterly contribution requirement applies for 2003 is equal to the ratio of the actuarial assets and the RPA'94 current liability as of 1/1/2002. This is:

112,000/110,000 = 101.8%

The plan is exempt from the quarterly contribution requirement for 2003. Statement I is true.

A plan is exempt from the additional funding charge if there are 100 or fewer plan participants (based upon the greatest number of participants on any day of the preceding year), or the Gateway percentage for the current plan year is at least 90%, or if the Gateway percentage for the current plan year is at least 80% and the Gateway percentage for any two consecutive of the past three years was at least 90%. The Gateway percentage is determined as of the valuation date for the year, and is equal to the ratio of the actuarial assets (unreduced by the credit balance) to the current liability using the highest interest rate in the permissible range. See IRC sections 412(l)(6)(A) and 412(l)(9). Based upon this definition, the Gateway percentage for 2003 is equal to:

85,000/107,000 = 79.4%

Since the Gateway percentage is less than 80% and there were more than 100 participants in the prior year, the plan is not exempt from the additional funding charge for 2003. Statement II is false.

A plan is exempt from the liquidity requirement if the quarterly contribution requirement does not apply or there are 100 or fewer plan participants (based upon the greatest number of participants on any day of the preceding year). See Revenue Ruling 95-31, Q&A 7. In this case, the quarterly contribution requirement does not apply (see statement I), so the plan is exempt from the liquidity requirement (even though there were more than 100 participants in the preceding year). Note that it is irrelevant that the plan had a liquidity shortfall.

Statement III is true.

Answer is E.

Question 10

Contributions waived from the minimum funding requirement are amortized over a period of 5 years. The interest rate to amortize the waived deficiency in this question is 7% since no other interest rate has been given. The minimum required contribution for 2003 (before application of the full funding limitation) is:

$(60{,}000 + 80{,}000/\ddot{a}_{\overline{5}|}) \times 1.07 = (60{,}000 + 18{,}235) \times 1.07 = 83{,}711$

The ERISA full funding limitation under the aggregate funding method is based upon the normal cost and accrued liability as determined under the entry age normal method. Since current liability is not provided, only the ERISA full funding limitation can be checked in this question.

$$\text{ERISA full funding limit} = (AL_{EAN} + NC_{EAN} - \text{minimum}\{\text{market value; actuarial value}\}) \times 1.07$$
$$= (790{,}000 + 54{,}000 - 820{,}000) \times 1.07 = 25{,}680$$

The full funding credit is equal to the difference between the minimum required contribution and the full funding limit.

Full funding credit = 83,711 – 25,680 = 58,031

Answer is D.

Question 11

The expected asset value as of 1/1/2003 is equal to the accumulated value of the 1/1/2002 assets and the 2002 contribution, less the accumulated benefit payments for 2002. Compound interest is used here, although simple interest can also be used.

$$\text{Expected assets}_{1/1/2003} = (2{,}000{,}000 \times 1.07) + (400{,}000 \times 1.07^{3/12}) - (1{,}000{,}000 \times 1.07^{6/12})$$
$$= 1{,}512{,}415$$

The actual asset value as of 1/1/2003 can be determined using the balance equation.

Unfunded liability = Outstanding balance – Credit balance - Reconciliation account balance
Accrued liability – Actuarial assets = Outstanding balance – Credit balance
3,500,000 – Actuarial assets = 1,600,000 – 100,000
Actuarial assets = 2,000,000

The asset gain for 2002 is:

Asset gain = 2,000,000 – 1,512,415 = 487,585

Answer is D.

Question 12

Final average salary can be calculated under each of the two sets of assumptions for salary increases. Final valuation compensation is at age 51 (one year before retirement) in a beginning of year valuation. So, the final valuation compensation would occur in 6 years for each plan participant. The final three-year average compensation for each participant under each set of assumptions is:

Before 2003: $50{,}000 \times \frac{1.035^4 + 1.035^5 + 1.035^6}{3} = 59{,}408$

After 2002: $50{,}000 \times \frac{1.035^4 + 1.035^5 + (1.035^5)(1.4)}{3} = 66{,}633$

Since the benefit formula is based upon salary, the normal cost must be amortized as a level percentage of salary. Therefore, the amortization factor for years when the 3.5% salary increases are assumed is based upon the following implicit interest rate, j:

$$j = 1.07/1.035 - 1 = .033816$$

The normal cost under the aggregate method is equal to:

(PVFB – (Actuarial assets – Credit balance))/Temporary annuity

Under the original (pre-2003) assumptions,

$$\text{PVFB} = 50\% \times 59{,}408 \times 17 \text{ participants} \times \ddot{a}_{52}^{(12)} \times v^7 = 3{,}710{,}730$$
$$\text{NC} = (3{,}710{,}730 - 3{,}400{,}000)/\ddot{a}_{\overline{7}|j} = 48{,}939$$

Under the new (post-2002) assumptions, the salary increase in the last year is 40% rather than 3.5%. The 7-year temporary annuity is:

$$\ddot{a}_{\overline{6}|j} + (1.035^5)(1.4)v^6 = 6.638195$$

The valuation results under the new assumptions are:

$$\text{PVFB} = 50\% \times 66{,}633 \times 17 \text{ participants} \times \ddot{a}_{52}^{(12)} \times v^7 = 4{,}162{,}017$$
$$\text{NC} = (4{,}162{,}017 - 3{,}400{,}000)/6.638195 = 114{,}793$$

The normal cost increase due to the assumption change is:

$$114{,}793 - 48{,}939 = 65{,}854$$

Answer is B.

Question 13

The new amortization base (amortized over 30 years) due to the plan amendment is equal to the increase in the entry age normal accrued liability.

$$1{,}250{,}000 - 1{,}100{,}000 = 150{,}000$$

The minimum funding requirement for 2003 as of 12/31/2003 is:

$$72{,}000 = (NC_{1/1/2003} + 500{,}000/\ddot{a}_{\overline{30}|} + 150{,}000/\ddot{a}_{\overline{30}|} - 25{,}000) \times 1.07$$
$$72{,}000 = (NC_{1/1/2003} + 37{,}657 + 11{,}297 - 25{,}000) \times 1.07$$
$$NC_{1/1/2003} = 43{,}336$$

Answer is C.

Question 14

The employee contribution amount is not known, so the employer normal cost must be determined directly by using only the present value of future benefits attributable to employer contributions and only the assets attributable to employer contributions. It is not known how much of the assets given are attributable to employee contributions. However, the amount of the present value of future benefits attributable to future employee contributions is known, so those can be removed from the total present value of future benefits. The present value of future benefits attributable to past employee contributions will exactly equal the portion of the assets attributable to past employee contributions, so they do not need to be removed.

It is not known whether or not the benefit formula is salary based. However, there is only enough information to calculate the normal cost as a level dollar amount, so that will be the method used here. The temporary annuity as a level dollar amount is:

$$\frac{30\ddot{a}_{\overline{12}|} + 20\ddot{a}_{\overline{10}|}}{50} = 8.105298$$

The normal cost under the aggregate method is equal to:

$$NC = (PVFB - (\text{Actuarial assets} - \text{Credit balance}))/\text{Temporary annuity}$$
$$= (2{,}000{,}000 - 250{,}000 - 275{,}000)/8.105298$$
$$= 181{,}980$$

Answer is B.

Question 15

Since there is a credit balance of \$5,000 as of 12/31/2002, the contribution for 2002 deposited on 12/31/2002 must exceed the minimum by \$5,000. Therefore, the minimum required contribution for 2002 was \$27,000 (\$32,000 - \$5,000).

In order to determine the minimum required contribution for 2003, it is necessary to determine the amortization charges for 2002 used in the funding standard account (as they will also appear in the 2003 funding standard account).

$$CB_{12/31/2002} = (CB_{12/31/2001} \times 1.07) + Contribution_{2002} - (NC_{1/1/2002} + Amortization\ charges_{1/1/2002}) \times 1.07$$

$$5{,}000 = (2{,}500 \times 1.07) + 32{,}000 - (25{,}000 + Amortization\ charges_{1/1/2002}) \times 1.07$$

$$Amortization\ charges_{1/1/2002} = 2{,}734$$

The experience gain or loss for 2002 must be determined.

$$\text{Expected unfunded liability}_{1/1/2003} = [(\text{Unfunded liability}_{1/1/2002} + \text{Normal cost}_{1/1/2002}) \times 1.07] - \text{Contribution}_{2002}$$
$$= [(20{,}000 + 25{,}000) \times 1.07] - 32{,}000$$
$$= 16{,}150$$

$$\text{Actual unfunded liability}_{1/1/2003} = \text{AL (before amendment)}_{1/1/2003} - \text{Actuarial assets}_{1/1/2003}$$
$$= 305{,}000 - 300{,}000$$
$$= 5{,}000$$

2002 experience gain = 16,150 – 5,000 = 11,150

The gain is amortized over 5 years in the funding standard account. In addition, a new amortization base (to be amortized over 30 years) is established, equal to the difference between the accrued liability after and before the plan amendment. This new base is \$25,000 (\$330,000 - \$305,000).

The minimum funding requirement for 2003 as of 12/31/2003 is:

$$(28{,}000 + 2{,}734 - 11{,}150/\ddot{a}_{\overline{5}|} + 25{,}000/\ddot{a}_{\overline{30}|} - 5{,}000) \times 1.07$$
$$= (28{,}000 + 2{,}734 - 2{,}541 + 1{,}883 - 5{,}000) \times 1.07$$
$$= 26{,}831$$

The difference between the end of year minimums in 2002 and 2003 is:

27,000 – 26,831 = 169

Answer is A.

Question 16

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 Gateway percentage for 2003 is 78% and there were more than 100 participants in the plan in 2002, so the additional funding charge applies for 2003.

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 1/1/2003, this is:

$73\% = (\text{Actuarial assets}_{1/1/2003} - 24{,}000)/1{,}200{,}000$
$\text{Actuarial assets}_{1/1/2003} = 900{,}000$

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

Unfunded current liability = $1{,}200{,}000 - (900{,}000 - 24{,}000) = 324{,}000$

The unfunded old liability is \$0 (since the unfunded old liability amount is \$0). There are no unpredictable contingent event liabilities (this is given in the general conditions of the exam). Therefore, the entire unfunded current liability is considered to be unfunded new liability.

The applicable percentage that applies to the unfunded new liability using the given formula is:
$30\% - [(73\% - 60\%) \times .4] = .248$

The unfunded new liability amount is: $324{,}000 \times .248 = 80{,}352$

The Deficit Reduction Contribution (DRC) is equal to the sum of the unfunded new liability amount and the expected increase in current liability for 2003 due to the additional accrual for the year. This is:

DRC = $80{,}352 + 100{,}000 = 180{,}352$

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

$180{,}352 - (120{,}000 + 200{,}000/\ddot{a}_{\overline{30}|}) = 180{,}352 - (120{,}000 + 15{,}063) = 45{,}289$

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

$45{,}289 \times 1.06 = 48{,}006$

$\text{Minimum contribution}_{12/31/2003} = [(120{,}000 + 15{,}063 - 24{,}000) \times 1.07] + 48{,}006 = 166{,}843$

Answer is B.

Question 17

This question requires the valuation of the first two years of the plan. The initial unfunded liability under the attained age normal method is equal to the accrued liability under the unit credit method. The accrued liability under unit credit is equal to the present value of the prior year accruals. The accrued liability as of 1/1/2002 is:

$AL_{Smith} = \$35 \times 13 \text{ years} \times 12\,\ddot{a}_{65}^{(12)} \times v^{26} = 9{,}402$

$AL_{Jones} = \$35 \times 24 \text{ years} \times 12\,\ddot{a}_{65}^{(12)} \times v^{4} = 76{,}900$

$AL_{Total} = 9{,}402 + 76{,}900 = 86{,}302$

The present value of future benefits as of 1/1/2002 is:

$PVFB_{Smith} = \$35 \times 39 \text{ years} \times 12\,\ddot{a}_{65}^{(12)} \times v^{26} = 28{,}206$

$PVFB_{Jones} = \$35 \times 28 \text{ years} \times 12\,\ddot{a}_{65}^{(12)} \times v^{4} = 89{,}716$

$PVFB_{Total} = 28{,}206 + 89{,}716 = 117{,}922$

The normal cost under the attained age normal method is equal to:

$NC_{1/1/2002}$ = (PVFB – Actuarial assets – Unfunded liability)/Temporary annuity

$= (117{,}922 - 86{,}302)/[(\ddot{a}_{\overline{26}|} + \ddot{a}_{\overline{4}|})/2]$

$= 3{,}885$

Note that the temporary annuity is the average of the individual annuities for each active participant since the normal cost is determined as a level dollar amount (the general condition for the exam when the benefit formula is a flat dollar amount).

The minimum required contribution for 2002 as of 12/31/2002 is:

$(3{,}885 + 86{,}302/\ddot{a}_{\overline{30}|}) \times 1.07 = (3{,}885 + 6{,}500) \times 1.07 = 11{,}112$

The credit balance as of 12/31/2002 is:

$CB_{12/31/2002} = 16{,}000 - 11{,}112 = 4{,}888$

Jones is retired in the 1/1/2003 valuation. The early retirement benefit elected by Jones is:

$35 × 25 years of service × .88 early retirement reduction to age 62 = $770

The present value of this benefit as of 1/1/2003 is: $770 \times 12\,\ddot{a}_{62}^{(12)} = 97{,}944$

The actuarial value of assets as of 1/1/2003 is equal to the 2003 contribution of $16,000.

The unfunded liability as of 1/1/2003 is:

$$UL_{1/1/2003} = [(UL_{1/1/2002} + NC_{1/1/2002}) \times 1.07] - Contribution_{2002}$$
$$= [(86{,}302 + 3{,}885) \times 1.07] - 16{,}000$$
$$= 80{,}500$$

The present value of future benefits as of 1/1/2003 is equal to the present value of future benefits for Smith from 2002, increased with one year's interest, plus the present value of future benefits for Jones.

$$PVFB_{1/1/2003} = (28{,}206 \times 1.07) + 97{,}944 = 128{,}124$$

The normal cost for 2003 as of 1/1/2003 is:

$$NC_{1/1/2003} = (PVFB - \text{Actuarial assets} - \text{Unfunded liability})/\text{Temporary annuity}$$
$$= (128{,}124 - 16{,}000 - 80{,}500)/\ddot{a}_{\overline{25}|}$$
$$= 2{,}536$$

Note that the temporary annuity reflects only Smith as the sole active participant.

The minimum required contribution for 2003 as of 1/1/2003 is:

$$2{,}536 + 6{,}500 - 4{,}888 = 4{,}148$$

Answer is B.

Question 18

The balance equation can be used to determine the outstanding balance:

Unfunded liability = Outstanding balance – Credit balance - Reconciliation account balance
450,000 = Outstanding balance – 25,000
Outstanding balance = 450,000 + 25,000 = 475,000

The original amortization base was amortized over 30 years beginning on 7/1/1997. There are 24 years remaining as of 7/1/2003. The original base was:

$475{,}000 \times (\ddot{a}_{\overline{30}|} / \ddot{a}_{\overline{24}|}) = 513{,}918$

The deductible limit for 2003 is:

$(45{,}000 + 513{,}918 / \ddot{a}_{\overline{10}|}) \times 1.07^{6/12} = (45{,}000 + 68{,}384) \times 1.07^{6/12} = 117{,}285$

Note that interest for purposes of computing the normal cost plus the limit adjustment is given from the valuation date to the earlier of the plan year-end or the fiscal year end. In this case, the fiscal year end of 12/31/2003 is before the plan year-end of 6/30/2004, so only 6 months interest is given. Also note that either simple or compound interest may be used. Compound interest was used in this solution.

Technically, the deductible limit is equal to the greater of the minimum funding requirement or the normal cost plus limit adjustment. Clearly, with a credit balance of $25,000 at the beginning of the plan year, the minimum funding requirement would be far less than the normal cost plus limit adjustment of $117,285.

Answer is C.

Question 19

The minimum required contribution for 2002 as of 12/31/2002 is:

$(55{,}000 + 100{,}000/\ddot{a}_{\overline{30}|}) \times 1.07 = (55{,}000 + 7{,}531) \times 1.07 = 66{,}908$

The deductible limit for 2002 is:

$(55{,}000 + 100{,}000/\ddot{a}_{\overline{10}|}) \times 1.07 = (55{,}000 + 13{,}306) \times 1.07 = 73{,}087$

Since the contribution for 2002 is equal to the deductible limit and is contributed on 7/1/2002, it receives half of one year's interest. Note that the deductible limit is determined as of the last day of the fiscal year, even though the actual contribution is made in the middle of the year.

The credit balance as of 12/31/2002 is equal to the difference between the accumulated contribution and the minimum required contribution.

$CB_{12/31/2002} = (73{,}087 \times 1.035) - 66{,}908 = 8{,}737$

The experience gain or loss for 2002 must be determined. This is equal to the difference between the expected unfunded liability and the actual unfunded liability. The expected unfunded liability is equal to the accumulated value of the prior unfunded accrued liability and the prior normal cost less the accumulated prior contribution.

Expected $UL_{12/31/2002} = [(100{,}000 + 55{,}000) \times 1.07] - (73{,}087 \times 1.035) = 90{,}205$
Actual $UL_{12/31/2002} = 130{,}000 - 75{,}000 = 55{,}000$
2002 Gain $= 90{,}205 - 55{,}000 = 35{,}205$

The gain is amortized over 5 years for minimum funding purposes.

The minimum required contribution for 2003 as of 12/31/2003 is:

$$(40{,}000 + 100{,}000/\ddot{a}_{\overline{30}|} - 35{,}205/\ddot{a}_{\overline{5}|} - 8{,}737) \times 1.07 = (40{,}000 + 7{,}531 - 8{,}024 - 8{,}737) \times 1.07$$
$$= 32{,}924$$

Answer is B.

Question 20

The full funding liability under the ERISA full funding limit is based upon the Entry Age Normal accrued liability and normal cost under the Aggregate funding method (see Revenue Ruling 81-13). The OBRA'87 and RPA'94 full funding limitations include the expected benefit increases for the year. The ERISA and OBRA'87 full funding limitations use the smaller of the market or actuarial value of the assets, and the RPA'94 full funding limitation uses the actuarial value. The current liability is increased with interest to the end of the year using the current liability interest rate, while the assets and entry age normal accrued liability and normal cost are increased using the valuation interest rate.

ERISA FFL: $(675{,}000 + 75{,}000 - 801{,}000) \times 1.07 = 0$
OBRA'87 FFL: $[170\% \times (910{,}000 + 83{,}000) \times 1.06] - (801{,}000 \times 1.07) = 932{,}316$
RPA'94 FFL: $[90\% \times (910{,}000 + 83{,}000) \times 1.06] - (819{,}000 \times 1.07) = 70{,}992$

The overall full funding limitation is equal to the smaller of the ERISA or OBRA'87 limit, but not less than the RPA'94 limit. This is $70,992.

The answer is B.

Question 21

The deduction limit for the defined benefit plans alone under IRC section 404(a)(1) is:

12,000,000 + 1,500,000 = 13,500,000

The actual defined benefit contributions to the two plans is:

9,000,000 + 1,400,000 = 10,400,000

The defined benefit plans alone satisfy IRC section 404(a)(1).

The deduction limit for the defined contribution plans alone under IRC section 404(a)(3) is 25% of compensation:

25% × (22,000,000 + 10,000,000 + 6,000,000) = 9,500,000

The actual contributions to the two defined contribution plans is:

500,000 + 300,000 = 800,000

The defined contribution plans alone satisfy IRC section 404(a)(3).

The deduction limitation of IRC section 404(a)(7) provides that the combined deduction for DC and DB plans of the same employer (when there is at least one common participant in the plans, which is the case here since Plan A includes participants in both Plans C and D) cannot exceed the greater of 25% of compensation or the minimum in the defined benefit plans. The minimum in the defined benefit plans is $9,750,000 ($8,500,000 + $1,250,000). This exceeds 25% of compensation and is the 404(a)(7) limit.

The total contribution to the four plans is $11,200,000. This exceeds the 404(a)(7) limit by $1,450,000 ($11,200,000 - $9,750,000). The $1,450,000 is non-deductible.

Answer is C.

Note that there is an exception if the unfunded current liability exceeds the defined benefit minimum. That is not the case in this situation.

Question 22

The ERISA full funding limitation credit in 2002 resulted in all amortization bases as of 12/31/2002 becoming fully amortized. The new bases for 2003 have been listed. However, there is also an experience loss that must be determined. Under the rules of Revenue Ruling 81-213, it is assumed that the expected unfunded liability is 0. The actual unfunded accrued liability is equal to \$60,000 (\$170,000 - \$110,000). The difference between this and the other new amortization bases must be equal to the experience loss.

2002 Loss = 60,000 – 30,000 – 20,000 + 10,000 = 20,000

In order for the balance equation to work, the \$5,000 credit balance is added to the experience loss (see Revenue Ruling 81-213, section 10). So, the outstanding balance of the experience loss base is \$25,000 (\$20,000 + \$5,000).

Note that amortization bases due to experience gains and losses are amortized over 5 years, plan amendments over 30 years, assumption changes over 10 years, and method changes over 10 years.

The minimum required contribution for 2003 as of 12/31/2003 is:

$$(10{,}000 + 25{,}000/\ddot{a}_{\overline{5}|} + 30{,}000/\ddot{a}_{\overline{30}|} + 20{,}000/\ddot{a}_{\overline{10}|} - 10{,}000/\ddot{a}_{\overline{10}|} - 5{,}000) \times 1.07$$
$$= (10{,}000 + 5{,}698 + 2{,}259 + 2{,}661 - 1{,}331 - 5{,}000) \times 1.07$$
$$= 15{,}287$$

Answer is D.

Question 23

Amortization bases due to the initial accrued liability are amortized over 30 years, plan amendments over 30 years, and assumption changes over 10 years. The outstanding balance is amortized over the remaining period for each base.

The minimum required contribution for 2003 as of 12/31/2003 is:

$$(30{,}500 + 500{,}000/\ddot{a}_{\overline{24}|} + 50{,}000/\ddot{a}_{\overline{7}|} + 75{,}000/\ddot{a}_{\overline{29}|} - 3{,}000) \times 1.07$$
$$= (30{,}500 + 40{,}743 + 8{,}671 + 5{,}709 - 3{,}000) \times 1.07$$
$$= 88{,}407$$

Answer is D.

Question 24

The unit credit normal cost is equal to the present value of the benefit accrual for the current year, based upon projected average salary. In this question, there are no assumed salary increases, so the final three-year average will be equal to the 2003 valuation compensation of $190,000.

Normal cost = $4\% \times 190{,}000 \times \ddot{a}_{62}^{(12)} \times v^{13} = 29{,}172$

The unit credit accrued liability is equal to the present value of the benefit accrual for past years, based upon projected average salary. The participant has 2 years of past service as of 1/1/2003.

Accrued liability = $4\% \times 190{,}000 \times 2 \text{ years} \times \ddot{a}_{62}^{(12)} \times v^{13} = 58{,}344$

The minimum required contribution for 2003 as of 12/31/2003 is:

$(29{,}172 + 58{,}344/\ddot{a}_{\overline{30}|}) \times 1.07 = (29{,}172 + 4{,}394) \times 1.07 = 35{,}916$

Answer is D.

Question 25

Compensation must be limited under IRC section 401(a)(17) to $200,000 for purposes of determining the normal retirement benefit.

Normal retirement benefit = $2\% \times 200{,}000 \times 25$ years of service = 100,000

$PVFB_{1/1/2003} = 100{,}000\ \ddot{a}_{65}^{(12)} v^{15} = 100{,}000 \times 10.2 \div 1.07^{15} = 369{,}695$

$NC_{1/1/2003}$ = (PVFB – Actuarial Assets)/$\ddot{a}_{\overline{15}|j}$ (where j = 1.07/1.04 – 1)

= (369,695 – 190,000)/12.3854

= 14,509

The minimum required contribution (subject to the full funding limitation) for 2003 is:

$Minimum_{12/31/2003} = 14{,}509 \times 1.07 = 15{,}525$

The ERISA full funding limitation for the aggregate funding method is based upon the entry age normal accrued liability and normal cost per Revenue Ruling 81-13. The EAN normal cost and accrued liability as of 1/1/2003 are:

$NC_{1/1/2003} = 100{,}000\ \ddot{a}_{65}^{(12)} v^{25} / \ddot{a}_{\overline{25}|j} \times 1.04^{10}$ (where $j = 1.07/1.04 - 1$)

$= 100{,}000 \times 10.2 \div 1.07^{25} \div 18.1480 \times 1.4802 = 15{,}329$

$AL_{1/1/2003} = 15{,}329\ \ddot{s}_{\overline{10}|j} = 15{,}329 \times 11.7321 = 179{,}841$

The ERISA and OBRA'87 full funding limitations use the smaller of the market or actuarial value of the assets. The RPA'94 full funding limitation uses the actuarial value of the assets.

ERISA FFL = $(179{,}841 + 15{,}329 - 185{,}000) \times 1.07 = 10{,}882$
OBRA'87 FFL = $(170\% \times 175{,}000) - (185{,}000 \times 1.07) = 99{,}550$
RPA'94 FFL = $(90\% \times 175{,}000) - (190{,}000 \times 1.07) = 0$

The overall full funding limit is equal to the smaller of the ERISA and the OBRA'87 limits, but not less than the RPA'94 limit. This is the ERISA limit of $10,882. That is the minimum funding requirement for 2003 since it is less than the otherwise minimum of $15,525.

Answer is B.

Question 26

The quarterly contribution requirement for 2003 is equal to 25% of the smaller of the minimum funding requirement (without regard to the credit balance) for 2002 (as of 12/31/2002) and 90% of the minimum funding requirement (without regard to the credit balance) for 2003 (as of 1/1/2003).

Minimum for 2002 (as of 12/31/2002) = $(125{,}000 + 1{,}000{,}000 / \ddot{a}_{\overline{30}|}) \times 1.07 = 214{,}336$

90% of minimum for 2003 (as of 1/1/2003) = $90\% \times (140{,}000 + 1{,}000{,}000 / \ddot{a}_{\overline{30}|}) = 193{,}783$

Quarterly contribution requirement for 2003 = $25\% \times 193{,}783 = 48{,}446$

The credit balance as of 12/31/2002 can be used to pay for the 2003 quarterly contributions.

$CB_{12/31/2002}$ = Accumulated credit balance + Accumulated 2002 contribution – 2002 minimum
$= (5{,}000 \times 1.07) + (210{,}000 \times 1.07^{8.5/12}) - 214{,}336 = 11{,}323$

The credit balance was not enough to pay for the quarterly contribution due on 4/15/2003. Therefore, since the minimum required quarterly contribution was paid on 4/15/2003, there is no credit balance remaining to pay for the 7/15/2003 quarterly contribution. The minimum amount needed to satisfy the quarterly contribution requirement on 7/15/2003 is $48,446.

Answer is D.

Question 27

The minimum contribution increases by the normal cost associated with the increase in the accrual for 2003, and by the 30-year amortization of the increase in the accrued liability (present value of the increase in the past accruals).

Normal cost increase = $(50 - 42) \times 12\,\ddot{a}_{65}^{(12)} \times v^{14} = 372$

Accrued liability increase = $(47 - 42) \times 28$ years $\times\, 12\,\ddot{a}_{65}^{(12)} \times v^{14} = 6{,}515$

Increase in minimum as of 1/1/2003 = $372 + 6{,}515/\ddot{a}_{\overline{30}|} = 372 + 491 = 863$

Answer is B.

Question 28

The outstanding balance of each amortization base must be re-amortized at the new 7% interest rate. Note that for multiemployer plans, the assumption change bases are amortized over 30 years and the experience gain/loss bases are amortized over 15 years. The following chart summarizes this.

Type of base	Remaining Amortization Period	Outstanding balance on 1/1/2003	New amortization charge on 1/1/2003
Initial AL	27 years	$10{,}000 \times \ddot{a}_{\overline{27}|.075} = 122{,}995$	$122{,}995/\ddot{a}_{\overline{27}|.07} = 9{,}590$
Amendment	28 years	$30{,}000 \times \ddot{a}_{\overline{28}|.075} = 373{,}241$	$373{,}241/\ddot{a}_{\overline{28}|.07} = 28{,}740$
Mortality	29 years	$100{,}000 \times \ddot{a}_{\overline{29}|.075} = 1{,}257{,}338$	$1{,}257{,}338/\ddot{a}_{\overline{29}|.07} = 95{,}709$
Gain	14 years	$(50{,}000) \times \ddot{a}_{\overline{14}|.075} = (456{,}292)$	$(456{,}292)/\ddot{a}_{\overline{14}|.07} = (48{,}761)$
Interest rate	30 years	101,000	$101{,}000/\ddot{a}_{\overline{30}|.07} = 7{,}607$

The net amortization charges prior to the interest rate change were:

10,000 + 30,000 + 100,000 – 50,000 = 90,000

The net amortization charges after the interest rate change are:

9,590 + 28,740 + 95,709 – 48,761 + 7,607 = 92,885

The increase in the minimum requirement due to the interest rate change as of 1/1/2003 is:

20,000 + (92,885 – 90,000) = 22,885

Answer is B.

Question 29

The normal cost can be calculated using the old retirement age assumption of 65.

PVFB = \$20 × 35 years of service × $12\ddot{a}_{65}^{(12)} \times v^{10}$ = 34,759
NC = (PVFB – Actuarial Assets)/$\ddot{a}_{\overline{10}|}$ = (34,759 – 10,000)/7.5152 = 3,295

Next, calculate the normal cost using the old retirement age assumption of 64.

PVFB = \$20 × 34 years of service × $12\ddot{a}_{64}^{(12)} \times v^{9}$ = 37,061
NC = (PVFB – Actuarial Assets)/$\ddot{a}_{\overline{9}|}$ = (37,061 – 10,000)/6.9713 = 3,882

Increase in normal cost = 3,882 – 3,295 = 587

Answer is C.

Question 30

The deductible limit is equal to the greater of the minimum funding requirement or the normal cost plus the limit adjustment, subject to the full funding limitation of IRC section 404.

In order to determine the minimum funding requirement for 2003, it is necessary to first determine the credit balance in the funding standard account as of 12/31/2002. Since there is no initial accrued liability in 2002, this is equal to the excess of the contribution for 2002 (plus interest to the end of 2002) over the normal cost (plus interest to the end of 2002).

$CB_{12/31/2002}$ = (80,000 × 1.035) – (75,000 × 1.07) = 2,550

Note that interest for the partial year on the contribution can be calculated using either simple interest or compound interest.

The 2002 experience loss must next be determined. Since there was no unfunded accrued liability as of 1/1/2002, the expected unfunded accrued liability as of 1/1/2003 is equal to \$0. The loss is equal to the unfunded accrued liability as of 1/1/2003 of \$84,000 (\$134,000 - \$50,000). Since there is a credit balance of \$2,550, the outstanding balance of this loss for purposes of IRC section 412 is \$86,550 (\$84,000 + \$2,550). This is necessary to force the balance equation to work. See section 10 of Revenue Ruling 81-213.

The minimum required contribution for 2003 as of 12/31/2003 is:

(75,000 + 86,550/$\ddot{a}_{\overline{5}|}$ - 2,550) × 1.07 = (75,000 + 19,728 - 2,550) × 1.07 = 98,630

The full funding limitation for IRC section 412 must be checked.

ERISA FFL = (Accrued liability + Normal cost – (Assets – CB)) × 1.07
= (134,000 + 75,000 – (50,000 – 2,550)) × 1.07
= 172,859
OBRA'87 FFL = 170% of current liability – ((Assets – CB) × 1.07)
= (170% ×144,000) – ((50,000 – 2,550) × 1.07)
= 194,029

Note that the Assets used for the ERISA and OBRA'87 full funding limitations is equal to the smaller of the market or actuarial value. In this question, they have the same value.

It is unnecessary to determine the RPA'94 full funding limit since it is merely a floor on the ERISA and OBRA'87 full funding limitations. Since those limitations clearly do not apply, there is no need to go further.

The normal cost plus limit adjustment for 2003 as of 12/31/2003 is:

$(75{,}000 + 84{,}000/\ddot{a}_{\overline{10}|}) \times 1.07 = (75{,}000 + 11{,}177) \times 1.07 = 92{,}209$

Note that the amortization base for IRC section 404 is $84,000, since there is no balance equation to deal with under code section 404. The greater of the minimum funding requirement (subject to the IRC section 412 full funding limit) or the normal cost plus limit adjustment is equal to the minimum funding requirement of $98,630.

This must be limited to the IRC section 404 full funding limitation. The difference between the 412 and 404 full funding limitations is that there is no credit balance adjustment for the 404 limitations, and instead the assets are adjusted for undeducted contributions. There are no undeducted contributions in this question. The difference in the full funding limitations is therefore equal to the credit balance of $2,550 with interest. This is clearly not a great enough change for the 404 full funding limit to have any impact.

The deductible limit for 2003 is $98,630.

Answer is E.

Question 31

There are two amortization bases in this situation – the initial base and the 1999 gain or loss. The outstanding balance of this initial base as of 1/1/2003 is:

$200{,}000 \times \ddot{a}_{\overline{22}|} / \ddot{a}_{\overline{30}|} = 178{,}277$

The unfunded liability as of 1/1/2003 is equal to $70,000 ($595,000 - $525,000). Using the balance equation,

Unfunded liability = Outstanding balance – Credit balance
70,000 = 178,277 + Outstanding balance of 1999 (gain)/loss – 10,000
Outstanding balance of 1999 (gain)/loss = -98,277

Amortizing the outstanding balances over their remaining periods, the minimum funding requirement for 2003 as of 12/31/2003 is:

$(65{,}000 + 178{,}277/\ddot{a}_{\overline{22}|} - 98{,}277/\ddot{a}_{\overline{2}|} - 10{,}000) \times 1.07$
$= (65{,}000 + 15{,}063 - 50{,}800 - 10{,}000) \times 1.07 = 20{,}611$

Answer is C.

Question 32

Statement I is true. See Revenue Ruling 95-31, Q&A 7.

Statement II is true. See Revenue Ruling 95-31, Q&A 7.

Statement III is true. See Revenue Ruling 95-31, Q&A 10.

Answer is D.

Question 33

The deductible limit is equal to the greater of the minimum funding requirement (for the plan year beginning in 2003) or the normal cost plus the limit adjustment (adjusted with interest to 6/30/2003).

In order to determine the minimum funding requirement for 2003, it is necessary to first determine the credit balance in the funding standard account as of 12/31/2002. This is equal to the excess of the contribution for 2002 (plus interest to the end of 2002) and the credit balance as of 12/31/2001 (plus interest to the end of 2002) over the normal cost and amortization charges (plus interest to the end of 2002).

$CB_{12/31/2002} = 10{,}000 + (50{,}000 \times 1.035) + (5{,}000 \times 1.07) - [(50{,}000 + 10{,}000) \times 1.07] = 2{,}900$

Note that interest for the partial year on the contribution paid 6/30/2002 can be calculated using either simple interest or compound interest.

The minimum required contribution for 2003 as of 12/31/2003 is:

$(52{,}000 + 13{,}000 - 2{,}900) \times 1.07 = 66{,}447$

Of the $10,000 that was contributed on 12/31/2002 for the 2002 plan year, $7,100 was needed for minimum funding (this is the difference between $10,000 and the $2,900 credit balance). Under IRS regulation 1.404(a)-14(e)(1), this is considered to be an includible contribution, and can be added to the minimum funding requirement for deduction purposes for the fiscal year ending in 2003. That makes the deductible limit based upon minimum funding equal to $73,547 ($66,447 + $7,100).

The normal cost plus limit adjustment for the fiscal year ending 6/30/2003 is:

$(52{,}000 + 17{,}500) \times 1.035 = 71{,}933$

Note that the interest is charged to the earlier of the plan year-end or the fiscal year-end (see IRS regulation 1.404(a)-14(f)(3)) and can be calculated using either simple interest or compound interest.

There is not enough information to determine the full funding limitation in this question, so that can be ignored (per the general conditions of the exam).

The greater of the minimum funding requirement or the normal cost plus the limit adjustment is equal to the minimum funding requirement (including the includible contribution) of $73,547.

Answer is B.

Question 34

The normal cost under the unit credit method is equal to the present value of the increase in the benefit accrual for the year. Increasing the valuation interest rate would decrease the present value. Therefore, statement I is a true statement.

Similarly, the accrued liability under the unit credit method is equal to the present value of the benefit accruals from prior years. Changing the mortality table to a new table with a smaller probability of mortality would increase the present value. Therefore, statement II is a true statement.

Since the change in the interest rate decreases the present value and the change in the mortality table increases the present value, it is not clear whether the combined change would increase or decrease the present value. However, since both the accrued liability and normal cost use the same present value factors, they would either both increase or both decrease in value under the proposed changes. Therefore, statement III is a true statement.

Answer is D.

Question 35

The Gateway Percentage is equal to the ratio of the actuarial value of assets (unreduced by the credit balance) to the current liability using the maximum allowable interest rate. The Gateway Percentage for 2003 using the original asset valuation method is:

400,000/460,000 = 86.96%

The plan is exempt from the additional funding charge for 2003 if the 2003 Gateway Percentage is at least 80% but less than 90%, and the Gateway Percentages for two consecutive years out of 2000, 2001 and 2002 are at least 90%. Since the Gateway Percentages for 2001 and 2002 are each less than 90%, the additional funding charge applies under the original asset valuation method.

The unfunded current liability used to determine the additional funding charge is equal to the current liability less the actuarial value of assets (reduced by the credit balance). The funded current liability percentage is the ratio of the actuarial value of assets (reduced by the credit balance) to the current liability.

UCL = 460,000 – (400,000 – 10,000) = 70,000
Funded CL% = (400,000 – 10,000)/460,000 = 84.78%

The unfunded current liability is divided among the unfunded old liability, the unfunded new liability and the unpredictable contingent event liability. It is given that the unfunded old liability is equal to $0, and it is assumed as a general exam condition that there are no unpredictable contingent event benefits. Therefore, the entire unfunded current liability is considered to be unfunded new liability. The unfunded new liability amount is equal to the unfunded new liability multiplied by the "applicable percentage."

Unfunded new liability amount = 70,000 × [.3 - .4(84.78% - 60.00%)] = 14,062

The additional funding charge as of the valuation date is equal to the unfunded new liability amount plus the expected increase in current liability for the year less the normal cost and net amortization charges (credits) under the plan's funding method. (Note that if this net result is less than 0, it is set to 0.) This is increased with interest to the end of the plan year using the current liability interest rate. Since there were fewer than 150 participants in the prior plan year, this result must be prorated for participants in excess of 100 but less than 150.

Additional funding charge = (14,062 + 50,000 – 50,000 – 10,000) × 1.0665 × (40/50) = 3,466

The Gateway Percentage for 2003 using the new asset valuation method is:

420,000/460,000 = 91.30%

Since the Gateway Percentage for 2003 is at least 90%, the additional funding charge does not apply under the new asset valuation method.

Therefore, the additional funding charge decreases from $3,466 to $0. This is a decrease of $3,466.

Answer is D.

Question 36

The minimum contribution under the Individual Aggregate funding method when it is split-funded is equal to the sum of the side fund normal cost and the cost of the death benefit (insurance policy). The cost is $50 for each $1,000 of death benefit.

Cost of insurance = $50 × 100 = $5,000

The cash value of the insurance at age 65 is equal to $75 for each $1,000 of death benefit.

Cash value of insurance = $75 × 100 = $7,500

The side fund normal cost reflects the cost of funding the portion of the normal retirement benefit that will not be paid for with the cash value of the insurance. Therefore, the value of the benefit at retirement must be reduced by the cash value.

Normal retirement benefit = 5% × \$60,000 × 4 years of service = \$12,000

$$\begin{aligned}\text{PVFB} &= (12{,}000 \times \ddot{a}_{65}^{(12)} - 7{,}500) \times v^3 \times {}_3p_{62} \\ &= (12{,}000 \times 9.24 - 7{,}500) \times .8163 \times .987 \times .988 \times .989 \\ &= 81{,}387\end{aligned}$$

$$\ddot{a}_{62:\overline{3}|} = 1 + vp_{62} + v^2{}_2p_{62} = 1 + .989/1.07 + (.989 \times .988)/1.07^2 = 2.7778$$

Side fund normal cost = 81,387/2.7778 = 29,299

Minimum required contribution$_{1/1/2003}$ = 29,299 + 5,000 = 34,299

Answer is C.

Question 37

The unfunded liability under the entry age normal funding method as of 1/1/2003 is equal to \$190,000 (\$980,000 - \$790,000). Using the balance equation,

Unfunded liability = Outstanding balance – Credit balance$_{12/31/2002}$
190,000 = 90,000 + 30,000 + 50,000 + 25,000 – Credit balance$_{12/31/2002}$
Credit balance$_{12/31/2002}$ = 5,000

The new amortization base due to the change in the funding method is equal to the difference between the unit credit accrued liability and the entry age normal accrued liability.

New credit base = 980,000 – 800,000 = 180,000

The amortization of each base as of 1/1/2003 is reflected in the following chart.

Base	Years left to amortize	Amortization
Initial unfunded liability	25	$90{,}000/\ddot{a}_{\overline{25}|} = 7{,}218$
Assumption change	6	$30{,}000/\ddot{a}_{\overline{6}|} = 5{,}882$
Plan change	28	$50{,}000/\ddot{a}_{\overline{28}|} = 3{,}850$
Actuarial loss	5	$25{,}000/\ddot{a}_{\overline{5}|} = 5{,}698$
Method change	10	$180{,}000/\ddot{a}_{\overline{10}|} = 23{,}951$

The minimum required contribution for 2003 as of 12/31/2003 is:

(37,000 + 7,218 + 5,882 + 3,850 + 5,698 – 23,951 – 5,000) × 1.07 = 32,846

Answer is C.

Question 38

The minimum required contribution for 2002 as of 12/31/2002 is:

$(340{,}800 + 2{,}500{,}000/\ddot{a}_{\overline{30}|}) \times 1.07 = (340{,}800 + 188{,}286) \times 1.07 = 566{,}122$

The credit balance as of 12/31/2002 is equal to the excess of the contribution for 2002 with interest to 12/31/2002 over the minimum required contribution for 2002.

$CB_{12/31/2002} = (700{,}000 \times 1.035) - 566{,}122 = 158{,}378$

Note that either simple interest or compound interest can be used to accumulate the contribution.

The valuation items must be developed for the 1/1/2003 valuation.

$\text{Actuarial assets}_{1/1/2003} = 700{,}000 + 45{,}000 = 745{,}000$

The 2002 experience gain or loss must be determined before the plan amendment changing the normal retirement benefit is taken into account.

$$\begin{aligned}\text{Expected unfunded liability} &= [(UAL_{1/1/2002} + NC_{1/1/2002}) \times 1.07] - (\text{Contribution}_{2002} \times 1.035) \\ &= [(2{,}500{,}000 + 340{,}800) \times 1.07] - (700{,}000 \times 1.035) \\ &= 2{,}315{,}156\end{aligned}$$

$$\begin{aligned}\text{Actual unfunded liability} &= AL_{1/1/2003} - \text{Actuarial assets}_{1/1/2003} \\ &= 3{,}300{,}000 - 745{,}000 = 2{,}555{,}000\end{aligned}$$

2002 Loss = 2,555,000 – 2,315,156 = 239,844

The benefit formula increased by 40% (from 5% to 7%), so the accrued liability and normal cost increase by 40% as well.

Increase in accrued liability = 40% × 3,300,000 = 1,320,000

Revised normal cost = 140% × 364,000 = 509,600

The amortization base due to the plan amendment is a 30-year base.

The minimum required contribution for 2003 as of 12/31/2003 is:

$$\begin{aligned}&(509{,}600 + 2{,}500{,}000/\ddot{a}_{\overline{30}|} + 1{,}320{,}000/\ddot{a}_{\overline{30}|} + 239{,}844/\ddot{a}_{\overline{5}|} - 158{,}378) \times 1.07 \\ &\quad = (509{,}600 + 188{,}286 + 99{,}415 + 54{,}669 - 158{,}378) \times 1.07 \\ &\quad = 742{,}143\end{aligned}$$

Answer is D.

Question 39

In order to avoid an additional funding charge for 2003, the Gateway Percentage must be at least 80%. That would exempt the plan from the additional funding charge since the Gateway Percentage was at least 90% in two consecutive of the past three years. The Gateway Percentage is equal to the ratio of the actuarial value of assets (ignoring any credit balance) to the current liability (using the largest permissible interest rate).

2003 Gateway Percentage = 30,500,000/41,200,000 = 74.03%

To determine the additional contribution:

Revised 2003 Gateway Percentage = (30,500,000 + C)/41,200,000 = 80%
C = 2,460,000

Answer is A.

Question 40

The accrued liability under the individual level premium method is equal to the difference between the present value of future benefits and the present value of future normal costs. The sole participant is age 42 as of 1/1/2003, and has 23 years of future normal costs.

$AL_{1/1/2003} = PVFB_{1/1/2003} - PVFNC_{1/1/2003} = 100{,}000 - (6{,}500 \times \ddot{a}_{\overline{23}|}) = 100{,}000 - 78{,}398 = 21{,}602$

Since there has never been a gain or loss before 2002, the expected unfunded liability is equal to \$0. Note that the individual level premium cost method does not have an initial unfunded liability. The 2002 loss is equal to the unfunded accrued liability as of 1/1/2003.

2002 loss = $AL_{1/1/2003}$ – Actuarial $assets_{1/1/2003} = 21{,}602 - 12{,}000 = 9{,}602$

The minimum required contribution for 2003 as of 12/31/2003 is:

$(6{,}500 + 9{,}602/\ddot{a}_{\overline{5}|}) \times 1.07 = (6{,}500 + 2{,}189) \times 1.07 = 9{,}297$

The deductible limit is equal to the greater of the minimum funding requirement or the normal cost plus the limit adjustment. Since the limit adjustment is equal to a 10-year amortization of the loss, the larger of the two is the minimum.

The full funding limitation can be checked.

ERISA FFL = (AL + NC – Assets) × 1.07 = (21,602 + 6,500 – 12,000) × 1.07 = 17,229
OBRA'87 FFL = (170% × CL) – (Assets × 1.07) = (170% × 18,000) – (12,000 × 1.07) = 17,760

It is unnecessary to check the RPA'94 full funding limit since it is simply a floor on the ERISA and OBRA'87 limits. The ERISA and OBRA'87 limits are already larger than the deductible limit, so they will not apply.

The deductible limit is \$9,297.

Answer is E.

Question 41

The 2002 experience gain or loss must be determined before the plan amendment changing the normal retirement benefit is taken into account. Since there were no investment gains or losses, the gain or loss can be determined by comparing the expected accrued liability to the actual accrued liability (before the plan amendment). Since the valuation results given for the 1/1/2003 valuation are based upon the amended plan, the accrued liability under the old plan will be equal to 75% of the accrued liability under the new plan (since the old benefit formula was 75% of the new formula).

$$\begin{aligned}\text{Expected accrued liability} &= (UAL_{1/1/2002} + NC_{1/1/2002}) \times 1.07 \\ &= (600{,}000 + 100{,}000) \times 1.07 \\ &= 749{,}000\end{aligned}$$

Actual accrued liability = $864{,}000 \times 75\% = 648{,}000$

2002 Gain = $749{,}000 - 648{,}000 = 101{,}000$

Increase in accrued liability = $25\% \times 864{,}000 = 216{,}000$

The amortization base due to the plan amendment is a 30-year base.

The minimum required contribution for 2002 as of 12/31/2002 is:

$(100{,}000 + 600{,}000/\ddot{a}_{\overline{30}|}) \times 1.07 = (100{,}000 + 45{,}189) \times 1.07 = 155{,}352$

The credit balance as of 12/31/2002 is equal to the excess of the contribution for 2002 with interest to 12/31/2002 over the minimum required contribution for 2002.

$CB_{12/31/2002} = (170{,}000 \times 1.0525) - 155{,}352 = 23{,}573$

Note that either simple interest or compound interest can be used to accumulate the contribution.

The minimum required contribution for 2003 as of 12/31/2003 is:

$$\begin{aligned}&(116{,}000 + 600{,}000/\ddot{a}_{\overline{30}|} + 216{,}000/\ddot{a}_{\overline{30}|} - 101{,}000/\ddot{a}_{\overline{5}|} - 23{,}573) \times 1.07 \\ &\quad = (116{,}000 + 45{,}189 + 16{,}268 - 23{,}021 - 23{,}573) \times 1.07 \\ &\quad = 140{,}023\end{aligned}$$

Answer is A.

Question 42

The attained age normal method uses the unit credit intial accrued liability as the initial unfunded liability, and the normal cost is determined under the following formula.

NC = (PVFB – Actuarial assets – Unfunded liabilty)/Average temporary annuity

Note that the normal cost is amortized using an average temporary annuity since the benefit formula is a dollar amount rather than compensation-based. The initial accrued liability under the unit credit method is equal to the present value of the prior benefit accruals. The following are the valuation results for 2002.

$UL_{1/1/2002} = 1{,}000 \times 10 \text{ years of service} \times \ddot{a}_{65}^{(12)} \times v^{20} = 23{,}878$

$PVFB_{1/1/2002} = 1{,}000 \times 30 \text{ years of service} \times \ddot{a}_{65}^{(12)} \times v^{20} = 71{,}634$

$NC_{1/1/2002} = (71{,}634 - 23{,}878)/\ddot{a}_{\overline{20}|} = 4{,}213$

The minimum required contribution for 2002 as of 12/31/2002 is:

$(4{,}213 + 23{,}878/\ddot{a}_{\overline{30}|}) \times 1.07 = (4{,}213 + 1{,}798) \times 1.07 = 6{,}432$

The deductible limit for 2002 is:

$(4{,}213 + 23{,}878/\ddot{a}_{\overline{10}|}) \times 1.07 = (4{,}213 + 3{,}177) \times 1.07 = 7{,}907$

The contribution made on 1/1/2002 is $7,907. (Note that the deductible limit is not reduced by the timing of the contribution.) The credit balance as of 12/31/2002 is equal to the excess of the contribution (with interest to the end of the year) and the minimum funding requirement.

$CB_{12/31/2002} = (7{,}907 \times 1.07) - 6{,}432 = 2{,}028$

The valuation items for the 2003 valuation can now be determined. The present value of future benefits as of 1/1/2003 is equal to the present value of future benefits as of 1/1/2002 increased with interest (since there were no new participants). The unfunded liability can be determined based upon the 1/1/2002 unfunded liability, normal cost and contribution.

$PVFB_{1/1/2003} = 71{,}634 \times 1.07 = 76{,}648$

$UL_{1/1/2003} = (UL_{1/1/2002} + NC_{1/1/2002} - 2002 \text{ contribution}) \times 1.07$

$= (23{,}878 + 4{,}213 - 7{,}907) \times 1.07$

$= 21{,}597$

$NC_{1/1/2003} = (76{,}648 - 11{,}000 - 21{,}597)/\ddot{a}_{\overline{19}|} = 3{,}983$

The minimum required contribution for 2003 as of 12/31/2003 is:

$(3{,}983 + 23{,}878/\ddot{a}_{\overline{30}|} - 2{,}028) \times 1.07 = (3{,}983 + 1{,}798 - 2{,}028) \times 1.07 = 4{,}016$

Answer is B.

Question 43

The unamortized balance of the initial unfunded liability must be reamortized using the new interest rate as of 1/1/2003 for purposes of IRC section 404. Since the deductible limit was paid on 12/31 each year, and three years have elapsed, there are 7 years remaining to fully amortize the intial unfunded liability for purposes of IRC section 404. The unamortized balance (determined using the original interest rate of 8%) of this base is:

$$220{,}000 \times \frac{\ddot{a}_{\overline{7}|.08}}{\ddot{a}_{\overline{10}|.08}} = 170{,}699$$

A new amortization base is created due to the the change in the interest rate, and equal to the difference between the entry age normal accrued liability both before and after the change. The new amortization base is $20,000 ($160,000 - $140,000). This base is amortized over 10 years for deduction purposes under IRC section 404(a)(1)(A)(iii). The deductible limit for 2003 is:

$(21{,}000 + 170{,}699/\ddot{a}_{\overline{7}|.07} + 20{,}000/\ddot{a}_{\overline{10}|.07}) \times 1.07 = (21{,}000 + 29{,}602 + 2{,}661) \times 1.07 = 56{,}991$

Answer is D.

Question 44

The unit credit accrued liability is equal to the present value of the accrued benefit attributable to past years of service. The sole participant has 18 years of past service as of 1/1/2003. Since there are probabilities of assumed retirement at ages 55, 62 and 65, the accrued liability is equal to the sum of the present value of the past service benefit associated with each of the three possible retirement ages (including any applicable early retirement reduction to the benefit).

$$\begin{aligned} AL_{1/1/2003} &= (40 \times 18 \text{ years} \times .58 \text{ early retirement reduction at age } 55 \times 12\ddot{a}_{55}^{(12)} \times v^5 \times .5) \\ &\quad + (40 \times 18 \text{ years} \times 12\ddot{a}_{62}^{(12)} \times v^{12} \times .5 \times .75) \\ &\quad + (40 \times 18 \text{ years} \times 12\ddot{a}_{65}^{(12)} \times v^{15} \times .5 \times .25) \\ &= 18{,}543 + 14{,}314 + 3{,}617 \\ &= 36{,}474 \end{aligned}$$

Answer is B.

Question 45

The normal cost and accrued liability at the end of 2003 are:

$NC_{12/31/2003} = 74{,}000 \times 1.07 = 79{,}180$
$AL_{12/31/2003} = 200{,}000 \times 1.07 = 214{,}000$

The fresh start base is equal to the unfunded accrued liability. This is:

$UAL_{12/31/2003} = 214{,}000 - 201{,}000 = 13{,}000$

The deductible limit under IRC section 404(a)(1)(A)(iii) as of 12/31/2003 is:

$79{,}180 + 13{,}000/\ddot{a}_{\overline{10}|} = 79{,}180 + 1{,}730 = 80{,}910$

The unfunded current liability, if larger, can be deducted under IRC section 404(a)(1)(D). This is:

$UCL_{12/31/2003} = 283{,}000 - 201{,}000 = 82{,}000$

Note that the deductible limit under IRC section 404(a)(1)(A)(iii) is subject to the full funding limitation, but the deductible limit under IRC section 404(a)(1)(D) is not. Since the $82,000 limit is larger, there is no need to check the full funding limitation.

Answer is C.