

Solutions to EA-2(A) Examination Fall, 2004

Question 1

Section 2.02 of Revenue Procedure 2000-40 indicates that the date for valuing assets is part of the funding method. Therefore, changing this date would be a change in the funding method of the plan. The statement is true.

Answer is A.

Question 2

In general, the additional funding charge applies if the plan had more than 100 participants in the prior year and the Gateway percentage for the current year is less than 90%. However, there is an exception under IRC section 412(l)(9)(B) that provides that the additional funding charge will not apply if the Gateway percentage for the current year is at least 80%, and the Gateway percentage in at least two of the past three **consecutive** years was at least 90%.

While the Gateway percentage for the current year is at least 80%, it is not the case that at least two of the past three consecutive years had Gateway percentages of at least 90% (2001 and 2003 are not consecutive years).

The additional funding requirement applies, and the statement is true.

Answer is A.

Question 3

IRC section 412(m)(1) provides that the quarterly contribution requirement applies if the funded current liability percentage for the **prior** year is less than 100%. Since the funded current liability percentage for 2003 is 98%, the quarterly contribution requirement applies for 2004.

The statement is false.

Answer is B.

Question 4

The normal cost will increase due to the increased present value of future benefits and will decrease due to the recognition of the new amortization base as a result of the plan amendment.

The unit credit accrued liability will not change on account of the plan amendment, since the amendment affects future service benefits only, and unit credit accrued liability is based upon benefits already accrued. Therefore, there will be no new amortization base due to the plan amendment.

Under the original plan benefit formula, the present value of future benefits based upon future service is equal to the difference between the total present value of future benefits and the unit credit accrued liability (which is the present value of future benefits based upon past service).

$$\text{PVFB (future service)} = \text{PVFB} - \text{UCAL} = 2,900,000 - 1,500,000 = 1,400,000$$

Since the benefit formula for future service increases by \$3 to \$33, an increase of 10%, the PVFB on account of future service will increase by 10%.

$$\text{Increase in PVFB (future service)} = 1,400,000 \times 10\% = 140,000$$

The increase in the normal cost can be calculated by amortizing this over future service. The amortization factor is the ratio of the present value of future service to the total number of participants.

$$\text{Increase in NC} = 140,000 \div (16,000/1,000) = 8,750$$

Answer is A.

Question 5

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 accrual for 2004 is \$40 per month.

Smith was hired at age 58, and has 5 years of service at age 63 on the 1/1/2004 valuation date. There is a termination decrement at age 63, and if Smith terminates on 1/1/2004, then Smith will not accrue a benefit for 2004. As a result, the withdrawal decrement must be applied in determining the normal cost. There is no need to worry about the vesting percentage since either Smith doesn't terminate, or he does terminate and has no accrual to apply the vesting schedule.

The normal cost for Smith as of 1/1/2004 is:

$$\text{NC} = 40 \times 12 \times \ddot{a}_{65}^{(12)} \times v^2 \times .94 = 3,641$$

Answer is B.

Question 6

The normal cost (as of 1/1/2003) is equal to:

$$\begin{aligned} \text{NC} &= \frac{\text{PVFB} - \text{Actuarial assets}}{\ddot{a}_{\overline{n}|}} \\ &= \frac{200,000 - 50,000}{1,500,000/100,000} \\ &= 10,000 \end{aligned}$$

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

$$10,000 \times 1.07 = 10,700$$

The present value of benefits as of 1/1/2003 can be adjusted to 1/1/2004 with interest (since there are no retired participants), and for the fact that salaries increased by only 3% instead of the expected 4%.

$$\text{PVFB}_{1/1/2004} = 200,000 \times 1.07 \times (1.03/1.04) = 211,942$$

The assets earned 5%, and the contribution received no interest since it was contributed on the last day of 2003.

$$\text{Assets}_{1/1/2004} = (50,000 \times 1.05) + 10,700 = 63,200$$

The ratio of the present value of future salary as of 1/1/2003 to the 2003 salary is 15 (1,500,000/100,000). This can be adjusted to obtain an amortization factor for the 1/1/2004 valuation:

$$1/1/2004 \ddot{a}_{\overline{n}|} = (15 - 1) \times (1.07/1.04) = 14.4038$$

Note that the interest rate for this amortization factor is actually equal to $j\%$, where $j = 1.07/1.04 - 1$. As a result, the actual salary increase has no effect on the amortization factor.

The normal cost (as of 1/1/2004) is equal to:

$$\begin{aligned} \text{NC} &= \frac{\text{PVFB} - \text{Actuarial assets}}{\ddot{a}_{\overline{n}|}} \\ &= \frac{211,942 - 63,200}{14.4038} \\ &= 10,327 \end{aligned}$$

Answer is E.

Question 7

The ERISA full funding limitation is equal to the entry age normal 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. Note that Revenue Ruling 81-13 indicates that the accrued liability and normal cost under the entry age normal method is used for calculating the ERISA full funding limit in spread gain methods, such as the Aggregate method.

$$\text{ERISA full funding limit} = (105,000 + 10,000 - 90,000) \times 1.07 = 26,750$$

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, less the actuarial value of the assets (unreduced by the credit balance), rolled forward with valuation interest to the end of the year.

$$\text{RPA'94 full funding limit} = (90\% \times [75,000 + 11,000] \times 1.0655) - (108,000 \times 1.07) = 0$$

The full funding limitation for 2004 is \$26,750.

Answer is D.

Question 8

As of the plan effective date, the sole participant had 15 years of past service. The initial accrued liability under the unit credit method is equal to the present value of the past service benefit.

$$\text{Past service benefit as of 1/1/2003} = (\$30 \times 10 \text{ years}) + (\$35 \times 5 \text{ years}) = \$475$$

$$\text{Accrued liability as of 1/1/2003} = \$475 \times 12 \times \ddot{a}_{65@7\%}^{(12)} \times v_{@7\%}^{26} = \$9,570$$

The initial accrued liability is amortized over 30 years. However, due to the change in the interest rate as of 1/1/2004, its outstanding balance must be re-amortized over its remaining 29 years at the new interest rate of 5%.

$$\text{Outstanding balance as of 1/1/2004} = \$9,570 \times \frac{\ddot{a}_{29,07}}{\ddot{a}_{30,07}} = \$9,469$$

A new amortization base must be established effective 1/1/2004 to reflect the new interest rate. This is equal to the difference between the accrued liability at the new interest rate and the accrued liability at the old interest rate. It is amortized over 10 years for minimum funding.

Past service benefit as of 1/1/2004 = $(\$30 \times 10 \text{ years}) + (\$35 \times 6 \text{ years}) = \510

New accrued liability as of 1/1/2004 = $\$510 \times 12 \times \ddot{a}_{65@5\%}^{(12)} \times v_{@5\%}^{25} = \$20,783$

Old accrued liability as of 1/1/2004 = $\$510 \times 12 \times \ddot{a}_{65@7\%}^{(12)} \times v_{@7\%}^{25} = \$10,994$

New amortization base = $\$20,783 - \$10,994 = \$9,789$

The normal cost as of 1/1/2004 is equal to the present value of the 2004 accrual.

Normal cost as of 1/1/2004 = $\$35 \times 12 \times \ddot{a}_{65@5\%}^{(12)} \times v_{@5\%}^{25} = \$1,426$

The minimum required contribution for 2004 as of 12/31/2004 is:

$$\left(1,426 + \frac{9,469}{\ddot{a}_{29|0.05}} + \frac{9,789}{\ddot{a}_{10|0.05}}\right) \times 1.05 = (1,426 + 596 + 1,207) \times 1.05 = 3,390$$

Answer is D.

Question 9

Six years have elapsed since the effective date of the plan. The amortization charge is equal to the outstanding balance of the initial unfunded liability amortized over the remaining 24 years.

$$\text{Amortization charge} = 2,850,000 / \ddot{a}_{\overline{24}|} = 232,232$$

The amortization base has actually been amortized over 25 years. This amortization can be determined using the original amount of the base.

$$\text{Original base} = 232,232 \times \ddot{a}_{\overline{30}|} = 3,083,500$$

$$\text{25-year amortization} = 3,083,500 / \ddot{a}_{\overline{25}|} = 247,287$$

The credit balance each year is equal to the difference between the actual amortization payment and the minimum amortization payment. The increase in the credit balance each year is:

$$\text{Credit balance increase} = (247,287 - 232,232) \times 1.07 = 16,109$$

$$\text{Credit balance as of 12/31/2003} = 16,109 \times s_{\overline{6}|} = 115,232$$

$$\begin{aligned} \text{Unfunded liability as of 1/1/2004} &= \text{Outstanding balance} - \text{credit balance} \\ &= 2,850,000 - 115,232 = 2,734,768 \end{aligned}$$

The normal cost (as of 1/1/2004) is equal to:

$$\begin{aligned} \text{NC} &= \frac{\text{PVFB} - \text{Actuarial assets} - \text{Unfunded liability}}{\text{Present value of future salary} / \text{Annual salary}} \\ &= \frac{9,750,000 - 2,850,000 - 2,734,768}{22,675,000 / 2,000,000} \\ &= 367,385 \end{aligned}$$

The minimum required contribution as of 12/31/2004 is:

$$(367,385 + 232,232 - 115,232) \times 1.07 = 518,292$$

Answer is B.

Question 10

Each amortization base previously amortized (the original base and the 2002 gain) at the old interest rate of 7% must be re-amortized over the remaining period at the new interest rate of 6%.

The outstanding balance as of 1/1/2004 of each base at the old interest rate is:

$$\text{Outstanding balance of original base} = 450,000 \times \frac{\ddot{a}_{\overline{28}|.07}}{\ddot{a}_{\overline{30}|.07}} = 440,139$$

$$\text{Outstanding balance of 2002 gain} = (40,000) \times \frac{\ddot{a}_{\overline{4}|.07}}{\ddot{a}_{\overline{5}|.07}} = (33,044)$$

The minimum required contribution for 2004 as of 12/31/2004 is:

$$\begin{aligned} & (30,000 + \frac{440,139}{\ddot{a}_{\overline{28}|.06}} - \frac{33,044}{\ddot{a}_{\overline{4}|.06}} + \frac{70,000}{\ddot{a}_{\overline{5}|.06}} + \frac{80,000}{\ddot{a}_{\overline{10}|.06}} - 5,200) \times 1.06 \\ & = (30,000 + 30,973 - 8,996 + 15,677 + 10,254 - 5,200) \times 1.06 = 77,070 \end{aligned}$$

The contribution receives interest for half of 2004 since it was contributed on June 30. Note that interest can be credited using either simple or compound interest. The credit balance in the funding standard account as of 12/31/2004 is:

$$\text{CB} = (90,000 \times 1.03) - 77,070 = 15,630$$

Answer is B.

Question 11

Gains and losses are determined by comparing the expected to actual values. In the case of the total experience loss for 2003, a comparison of the expected unfunded liability to the actual unfunded liability is necessary.

The expected unfunded liability as of 1/1/2004 is equal to the 1/1/2003 unfunded liability plus the 1/1/2003 normal cost, increased with valuation interest to 1/1/2004, and reduced by the contribution for 2003 (no interest accumulation is needed on the contribution since it was contributed on the last day of 2003). Note that the 1/1/2003 unfunded liability is equal to the difference between the accrued liability and the actuarial assets. This is \$0 since the assets and the accrued liability were equal.

$$\text{Expected UL as of 1/1/2004} = [(0 + 10,000) \times 1.07] - 50,000 = -39,300$$

Note that for funding purposes under the internal revenue code, the negative expected UL is set to \$0 per Revenue Ruling 81-213. However, this question is not dealing with minimum funding standards, so the expected UL can be kept negative.

$$\text{Actual UL as of 1/1/2004} = \text{Accrued liability} - \text{actuarial assets} = 125,000 - 110,000 = 15,000$$

$$\text{Experience loss for 2003} = 15,000 - (-39,300) = 54,300$$

Therefore, $x = 54,300$.

The expected asset value as of 1/1/2004 is equal to the accumulated value of the 1/1/2003 assets and the 2003 contribution, less the accumulated benefit payments for 2003. Simple interest is used here, although compound interest can also be used.

$$\text{Expected assets}_{1/1/2004} = (120,000 \times 1.07) + 50,000 - (20,000 \times 1.035) = 157,700$$

The actual asset value as of 1/1/2004 is \$110,000.

The asset loss for 2003 is:

$$\text{Asset loss} = 157,700 - 110,000 = 47,700$$

Therefore, $y = 47,700$.

$$y/x = 47,700/54,300 = 87.85\%$$

Answer is D.

Question 12

The normal cost under the entry age normal funding method is determined from age at hire. For Smith, this is age 61. Since there is a salary scale, and the benefit formula is salary based, the normal cost at each age subsequent to age 61 will increase at the salary scale rate. The amortization of the normal cost uses the implicit interest rate:

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

$$\begin{aligned} \text{Normal cost at age 61} &= 1,000 \times 12 \times \ddot{a}_{65}^{(12)} \times v^4 \div \ddot{a}_{4,033816} \\ &= 12,000 \times 12.41 \times .7629 \div 3.8080 = 29,835 \end{aligned}$$

$$\text{Normal cost at age 62 (1/1/2004)} = 29,835 \times 1.035 = 30,879$$

Answer is A.

Question 13

The loss is equal to the difference between the actual value of the payments made and the expected accrued liability under the cost method (had the participants not terminated employment and/or begun receiving benefits).

Smith has retired with 20 years of service at age 60 and is eligible for an unreduced accrued benefit. Smith's accrued benefit is:

$$AB_{\text{Smith}} = \$50 \times 30 \text{ years} = \$1,500$$

The present value of Smith's benefit is:

$$PV_{\text{Smith}} = \$1,500 \times 12 \times \ddot{a}_{60}^{(12)} = \$1,500 \times 12 \times 10.38 = 186,840$$

The total value of the actual benefits paid to Smith and Jones is:

$$\text{Actual PV} = 186,840 + 50,000 = 236,840$$

The accrued liability under the entry age normal method must be determined for each participant as of 1/1/2004 (had they not terminated employment).

$$AL_{\text{Smith}} = \$50 \times 35 \text{ years of service} \times 12 \times \ddot{a}_{65}^{(12)} \times \frac{\ddot{S}_{30|}}{\ddot{S}_{35|}} = 132,592$$

$$AL_{\text{Jones}} = \$50 \times 35 \text{ years of service} \times 12 \times \ddot{a}_{65}^{(12)} \times \frac{\ddot{S}_{15|}}{\ddot{S}_{35|}} = 35,273$$

$$AL_{\text{Total}} = 132,592 + 35,273 = 167,865$$

$$2003 \text{ liability loss} = 236,840 - 167,865 = 68,975$$

Answer is C.

Question 14

The normal cost under the Aggregate cost method is equal to:

$$NC = \frac{\text{PVFB} - \text{Actuarial assets}}{\text{Present value of future salary} / \text{Annual salary}}$$

Note that the actuarial value of assets must be reduced by the credit balance when using this cost method to determine the IRC section 412 normal cost. In addition, the PVFB, present value of future salary (PVFS) and the annual salary are aggregated for all plan participants.

The PVFB and PVFS must be calculated for each participant.

Smith

$$PVFB = 50\% \times \$25,000 \times \ddot{a}_{65}^{(12)} \times v^{40} = \$8,348$$

$$PVFS = \$25,000 \times \ddot{a}_{40} = \$356,623$$

Jones

$$PVFB = 50\% \times \$150,000 \times 19/20 \times \ddot{a}_{65}^{(12)} \times v^{14} = \$276,320$$

$$PVFS = \$150,000 \times \ddot{a}_{14} = \$1,403,648$$

Note the service reduction for Jones due to service of less than 20 years (19 years of service at retirement in total).

The normal cost as of 1/1/2004 is:

$$NC = \frac{(8,348 + 276,320) - (50,000 - 5,000)}{(356,623 + 1,403,648) / (25,000 + 150,000)}$$

$$= 23,827$$

$$\text{Normal cost as of 12/31/2004} = 23,827 \times 1.07 = 25,495$$

Answer is D.

Question 15

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. Additional funding charges and full funding credits must be taken into account, but any credit balance in the funding standard account is ignored for this purpose. Late interest charges for the prior year are also taken into account for the prior year minimum.

For purposes of the 2004 quarterly contribution determination:

$$\text{2003 minimum as of 12/31/2003} = [(70,000 + 150,000) \times 1.07] + 80,000 + 20,000 = 335,400$$

$$\text{2004 minimum as of 1/1/2004} = 105,000 + 360,000 - (100,000 \div 1.07) = 371,542$$

$$\text{90\% of 2004 minimum} = 90\% \times 371,542 = 334,388$$

The smaller of the 2003 minimum or 90% of the 2004 minimum is 334,388.

$$\text{2004 quarterly contribution requirement} = 25\% \times 334,388 = 83,597$$

Answer is D.

Question 16

The funding standard account items that make up the reconciliation account are additional funding charges, quarterly contribution late interest charges, and amortization of waived funding deficiencies. In this question, there are additional funding charges and late interest charges that impact the reconciliation account.

The additional funding charge for 2003 must be determined.

The additional funding charge applies whenever the Gateway percentage (the ratio of the actuarial assets – unadjusted by the credit balance – to the current liability determined using the highest allowable interest rate) is less than 80% and there are more than 100 participants in the plan on at least one day of the prior year. There were more than 100 participants in 2002. The Gateway percentage for 2003 is 83% ($1,100,000/1,325,000$). When the Gateway percentage is greater than 80% and less than 90%, the additional funding charge does not apply if the Gateway percentage in any two consecutive of the past three years was at least 90%. This is not the case, since it is given that the current liability percentage (it is assumed that includes the Gateway percentage) has never been greater than 90%. (Note that it must be assumed that the intention here was really to state that the current liability percentage has always been less than 90%, since if it was exactly 90% in any two consecutive of the past three years, then the additional funding charge would not apply.) Therefore, the additional funding charge applies for 2003.

For purposes of determining the additional funding charge, the funded current liability percentage is equal to the ratio of the actuarial value of assets (NOT increased by the funding deficiency) to the current liability. As of 1/1/2003, this is:

$$80\% = 1,100,000/1,375,000$$

The unfunded current liability for purposes of the additional funding charge is equal to the current liability less the actuarial value of assets (again, NOT increased by the funding deficiency).

$$\text{Unfunded current liability} = 1,375,000 - 1,100,000 = 275,000$$

There is insufficient information to determine the unfunded old liability, so it will be assumed that there is not unfunded old liability. It is also assumed that 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:
 $30\% - [(80\% - 60\%) \times .4] = .22$

$$\text{The unfunded new liability amount is: } 275,000 \times .22 = 60,500$$

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:

$$\text{DRC} = 60,500 + 114,000 = 174,500$$

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

$$174,500 - (110,000 + 20,000) = 44,500$$

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

$$44,500 \times 1.06 = 47,170$$

This must be pro-rated for participants from the prior year less than 150 (but more than 100). Since the greatest number of participants in the prior year was 140, the preliminary additional funding charge is pro-rated by 40/50.

$$\text{Additional funding charge for 2003} = 47,170 \times 40/50 = 37,736$$

The reconciliation account balance as of 1/1/2004 is equal to the prior year reconciliation account balance, increased with interest at the valuation rate, plus the additional funding charge and late interest charge for 2003.

$$\text{Reconciliation account balance as of 1/1/2004} = (75,000 \times 1.07) + 37,736 + 5,000 = 122,986$$

Answer is C.

Question 17

This question requires an understanding of the balance equation:

$$\text{Unfunded liability} = \text{Outstanding balance} - \text{Credit balance} - \text{Reconciliation balance}$$

In an immediate gain cost method, the unfunded liability is equal to the accrued liability less the actuarial value of the assets. Substituting into the above equation,

$$800,000 - 600,000 = X \ddot{a}_{\overline{3}|} + 4,200 \ddot{a}_{\overline{28}|} + 25,000 \ddot{a}_{\overline{4}|} + 33,000 \ddot{a}_{\overline{5}|} - 15,000 - 20,000$$

$$200,000 = 2.8080X + 54,544 + 90,608 + 144,778 - 15,000 - 20,000$$

$$X = -19,562$$

Answer is C.

Question 18

When the pre-retirement interest assumption is changed, the outstanding balance of the existing amortization bases must be re-amortized over their remaining periods for IRC section 412 at the new interest rate. Since the cost method is frozen initial liability, there is only one base (the initial base established on the plan effective date of 1/1/1994).

The balance equation can be used to determine the outstanding balance of this base (using values at the old 6% interest rate):

$$\text{Unfunded liability} = \text{Outstanding balance} - \text{Credit balance}$$

$$240,000 = \text{Outstanding balance} - 40,000$$

$$\text{Outstanding balance} = 240,000 + 40,000 = 280,000$$

The original amortization base was amortized over 30 years beginning on 1/1/1994. There are 20 years remaining as of 1/1/2004.

A new amortization base must be set up due to the change in the interest assumption. This base is amortized over 10 years for IRC section 412, and is equal to the difference between the unfunded liability at the new 7% interest rate and the unfunded liability at the old 6% interest rate.

New amortization base = $160,000 - 240,000 = -80,000$

The minimum required contribution for 2004 as of 12/31/2004 is:

$$(60,000 + 280,000/\ddot{a}_{\overline{20}|,0.07} - 80,000/\ddot{a}_{\overline{10}|,0.07} - 40,000) \times 1.07 \\ = (60,000 + 24,701 - 10,645 - 40,000) \times 1.07 = 36,440$$

Answer is E.

Question 19

The deductible limit for 2003 is:

$$(45,000 + 350,000/\ddot{a}_{\overline{10}|}) \times 1.07 = (45,000 + 46,572) \times 1.07 = 97,982$$

This is the contribution for 2003. The credit balance as of 12/31/2003 is equal to the difference between the contribution (which receives no interest since it was contributed on the last day of the year) and the minimum required contribution.

$$CB_{12/31/2003} = 97,982 - [(45,000 + 350,000/\ddot{a}_{\overline{30}|}) \times 1.07] \\ = 97,982 - [(45,000 + 26,360) \times 1.07] = 21,627$$

Note that the credit balance could also have been determined by taking the difference between the 10 and 30-year amortizations of the unfunded liability, with interest to the end of the year.

$$CB_{12/31/2003} = (46,572 - 26,360) \times 1.07 = 21,627$$

The experience gain or loss for 2003 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. Note that the actuarial value of the assets as of 12/31/2003 must be equal to 97,982 (the contribution deposited on that day).

$$\text{Expected UL}_{12/31/2003} = [(350,000 + 45,000) \times 1.07] - 97,982 = 324,668$$

$$\text{Actual UL}_{12/31/2003} = 370,000 - 97,982 = 272,018$$

$$2003 \text{ Gain} = 324,668 - 272,018 = 52,650$$

The gain is amortized over 5 years for minimum funding purposes. The minimum required contribution for 2004 as of 12/31/2004 is:

$$(35,000 + 350,000/\ddot{a}_{\overline{30}|} - 52,650/\ddot{a}_{\overline{5}|} - 21,627) \times 1.07 \\ = (35,000 + 26,360 - 12,001 - 21,627) \times 1.07 = 29,673$$

Answer is B.

Question 20

The ERISA full funding limitation is based upon the Entry Age Normal accrued liability and normal cost when using the frozen initial liability funding method (see Revenue Ruling 81-13). There is not enough information to determine the RPA'94 full funding limitation, so that can be ignored (per the general exam conditions). The ERISA full funding limitation uses the smaller of the market or actuarial value of the assets. For IRC section 404, the credit balance is ignored. However, there was a contribution made on 1/1/2004 that is not included in the assets, part of which was deducted for 2003. This must be added to the assets. The smaller of the market or actuarial value of the assets is the market value of \$185,000. Adding the receivable contribution in the amount of \$20,000, the market value of assets becomes \$205,000. The undeducted contribution of \$8,000 (\$20,000 - \$12,000) must be subtracted from the assets for purposes of IRC section 404. However, this subtraction is done as of the end of the year, so that there is no interest accumulation. The assets are rolled forward with interest before the subtraction.

$$\begin{aligned} \text{ERISA FFL} &= [(\text{EAN AL} + \text{EAN NC}) \times 1.07] - [(\text{Assets} \times 1.07) - \text{Undeducted contribution}] \\ &= [(288,000 + 59,000) \times 1.07] - [(205,000 \times 1.07) - 8,000] = 159,940 \end{aligned}$$

The answer is C.

Question 21

The outstanding balance of the two given amortization bases can be determined as of 1/1/2004:

$$\text{Initial base outstanding balance} = 65,000 \ddot{a}_{\overline{27}|} = 833,676$$

$$\text{Assumption change base outstanding balance} = 15,000 \ddot{a}_{\overline{10}|} = 112,728$$

There have been no gains or losses prior to 2003. The balance equation can be used to determine the amount of any loss that might have occurred in 2003.

$$\text{Unfunded liability} = \text{Outstanding balance} - \text{Credit balance} - \text{Reconciliation balance}$$

In an immediate gain cost method, the unfunded liability is equal to the accrued liability less the actuarial value of the assets. Substituting into the above equation,

$$2,000,000 - 1,100,000 = X + 833,676 + 112,728 - 10,000 - 5,000 \quad \text{and } X = -31,404$$

Therefore, there was a gain of 31,404 in 2003.

The deductible limit is equal to the greater of the minimum funding requirement or the normal cost plus limit adjustment (subject to the IRC section 404 full funding limitation). Since the credit balance reduces the minimum funding requirement, it should be clear that the normal cost plus the limit adjustment is the largest.

In order to determine the limit adjustment, it is necessary to know the initial amount of each amortization base. Since the 2003 gain base and the assumption change bases are new, their current outstanding balances are also the initial amount of the base. For the initial base (established in 2001), the initial amount of the base was:

$$65,000 \ddot{a}_{\overline{30}|} = 863,049$$

Normal cost plus limit adjustment as of 12/31/2004

$$\begin{aligned} &= (100,000 + 863,049/\ddot{a}_{\overline{10}|} + 112,728/\ddot{a}_{\overline{10}|} - 31,404/\ddot{a}_{\overline{10}|}) \times 1.07 \\ &= (100,000 + 114,840 + 15,000 - 4,179) \times 1.07 = 241,457 \end{aligned}$$

The full funding limitation must be checked. Note that the credit balance is ignored for IRC section 404.

$$\begin{aligned} \text{ERISA FFL: } (AL + NC - \text{Assets}) \times 1.07 &= (2,000,000 + 100,000 - 1,100,000) \times 1.07 \\ &= 1,070,000 \end{aligned}$$

There is no need to check the RPA '94 full funding limit since the ERISA limit already is larger than the normal cost plus limit adjustment. The RPA '94 limit can only increase the full funding limit, which clearly does not apply.

The deductible limit for 2004 is \$241,457.

The credit balance is equal to the difference between the credits in the 2004 funding standard account (contribution and credit balance) and the charges (normal cost and amortization charges less credits). Clearly, the full funding limitation will not apply.

$$\begin{aligned} \text{CB}_{12/31/2004} &= [(10,000 \times 1.07) + 241,457] - [(100,000 + 65,000 + 15,000 - 31,404/\ddot{a}_{\overline{5}|}) \times 1.07] \\ &= 252,157 - [(180,000 - 7,158) \times 1.07] = 67,216 \end{aligned}$$

Answer is D.

Question 22

The gain or loss is equal to the difference between the actual value of the retirement benefit and the expected accrued liability under the cost method (had the participant not retired early).

The participant has retired with 30 years of service at age 63. The accrued benefit, reduced 6% for 2 years due to early retirement, is:

$$AB = \$25 \times 30 \text{ years} \times (1 - (.06)(2 \text{ years})) = \$660$$

The present value of the early retirement benefit is:

$$PV = \$660 \times 12 \times \ddot{a}_{63}^{(12)} = \$660 \times 12 \times 9.72 = 76,982$$

Under the unit credit cost method, the accrued liability (if the participant had not retired early) is equal to the present value of the accrual from past years. This is:

$$AL = \$25 \times 30 \text{ years} \times 12 \times \ddot{a}_{65}^{(12)} \times v^2 = 9,000 \times 9.24 \times .8734 = 72,632$$

$$\text{Loss due to early retirement} = 76,982 - 72,632 = 4,350$$

Answer is B.

Question 23

The additional funding charge applies whenever the Gateway percentage (the ratio of the actuarial assets – unadjusted by the credit balance – to the current liability determined using the highest allowable interest rate) is less than 80% and there are more than 100 participants in the plan on at least one day of the prior year. There were more than 150 participants in 2003. The Gateway percentage for 2004 is 78% (350,000/450,000). Note that it is assumed that the given current liability is at the top of the range (the general conditions of the exam state that when only one current liability is provided, it is used for all purposes). Therefore, the additional funding charge applies for 2004.

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 1/1/2004, this is:

$$73.84\% = (350,000 - 17,700)/450,000$$

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).

$$\text{Unfunded current liability} = 450,000 - (350,000 - 17,700) = 117,700$$

Since the plan was effective after 1989, there is no unfunded old liability. It is assumed that 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:
 $30\% - [(73.84\% - 60\%) \times .4] = .24464$

The unfunded new liability amount is: $117,700 \times .24464 = 28,794$

The Deficit Reduction Contribution (DRC) is equal to the sum of the unfunded new liability amount and the expected increase in current liability for 2004 due to the additional accrual for the year. This is:

$$\text{DRC} = 28,794 + 25,000 = 53,794$$

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

$$53,794 - (27,000 + 3,500 - 11,000) = 34,294$$

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

$$34,294 \times 1.0655 = 36,540$$

Note that this amount would be reduced if there had been less than 150 participants in the 2003 plan year.

Answer is E.

Question 24

Since all prior amortization bases were considered fully amortized, the only amortization base for the 1/1/2004 valuation is the 2003 experience loss. According to Revenue Ruling 81-213, the experience loss is equal to the unfunded accrued liability in a year following the year that all bases become fully amortized. Therefore, the 2003 experience loss is:

$$\text{2003 loss} = \text{Accrued liability} - \text{Actuarial assets} = 1,000,000 - 800,000 = 200,000$$

For minimum funding purposes, section 10 of Revenue Ruling 81-213 indicates that the credit balance must be added to the loss to determine the outstanding balance of the loss (which is to be amortized over 5 years). For purposes of the limit adjustment under IRC section 404, there is no adjustment to the 2003 loss; that is, 200,000 becomes a 10-year amortization base.

$$\text{Outstanding balance of 2003 loss} = 200,000 + 10,000 = 210,000$$

The minimum required contribution for 2004 as of 12/31/2004 is:

$$(75,000 + 210,000/\ddot{a}_{\overline{5}|} - 10,000) \times 1.07 = (75,000 + 47,866 - 10,000) \times 1.07 = 120,767$$

The normal cost plus limit adjustment for 2004 under IRC section 404 is:

$$(75,000 + 200,000/\ddot{a}_{\overline{10}|}) \times 1.07 = (75,000 + 26,613) \times 1.07 = 108,726$$

The deductible limit is equal to the greater of the minimum required contribution or the normal cost plus limit adjustment. In this case that is the minimum required contribution of 120,767.

Answer is D.

Note: IRC section 404(a)(1)(A)(i) states that the deductible limit is “the amount necessary to satisfy the minimum funding standard provided by section 412(a) ...”. It is not clear from this statement whether it is intended that the minimum funding requirement be determined before the date of the contribution for the year is known, or after. The reason that this is an issue is that if the contribution is made on 7/1/2004, then it will earn interest to the end of the year, thus reducing the minimum funding requirement for 2004. This interpretation would require backing 6 months interest out of the end of year minimum funding requirement.

$$120,767 \div 1.035 = 116,683$$

This falls within range C. That is the original official correct answer range for this question. However, at the time of this writing, it appears that credit will also be given for answer choice D, following the logic above.

To summarize, for answer range C the numerical answer is 116,683. For answer range D the numerical answer is 120,767.

Question 25

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.

For purposes of the 2004 quarterly contribution determination:

$$\text{2003 minimum as of 12/31/2003} = 200,000 \times 1.07 = 214,000$$

$$\text{2004 minimum as of 1/1/2004} = 260,000$$

$$\text{90\% of 2004 minimum} = 90\% \times 260,000 = 234,000$$

The smaller of the 2003 minimum or 90% of the 2004 minimum is 214,000.

$$\text{2004 quarterly contribution requirement} = 25\% \times 214,000 = 53,500$$

The first two quarterly contributions for 2004 were made timely. However, the 10/15/2004 quarterly contribution is not made until 12/31/2004, and is 2½ months late. Late interest is equal to the difference between interest calculated on the late quarterly using the greatest of 175% of the Federal mid-term rate, the current liability rate, or the plan valuation rate, and interest calculated at the plan valuation rate. Since the greatest of the 3 rates is the plan valuation rate, the offsetting interest will be exactly equal to the interest penalty. Therefore, the late interest charge is \$0.

Answer is A.

Question 26

There is no new amortization base when changing from the entry age normal method to the frozen initial liability method since the initial base under frozen initial liability is calculated using entry age normal accrued liability. In addition, the normal cost under frozen initial liability will be exactly equal to the entry age normal cost when there have never been experience gains or losses.

As a result, the normal cost for 2004 is equal to the entry age normal cost (normal cost calculated from date of hire).

$$\text{NC} = 1,000 \times 12 \ddot{a}_{65}^{(12)} \times v^{20} \div \ddot{a}_{20} = 1,000 \times 120 \times .2584 \div 11.3356 = 2,735$$

The initial accrued liability is just the accumulated normal costs at the participant's entry age into the plan.

$$\text{Initial AL} = 2,735 \times \ddot{s}_{\overline{5}|} = 16,830$$

The minimum required contribution each year (without regard to the contributions made) is:

$$(2,735 + 16,830/\ddot{a}_{\overline{30}|}) \times 1.07 = (2,735 + 1,268) \times 1.07 = 4,283$$

Since \$5,000 is contributed each year on 12/31, the addition to the credit balance each year is \$717 (5,000 – 4,283). The accumulated credit balance as of 12/31/2003 is:

$$CB = 717 \times s_{\overline{3}|} = 2,305$$

The minimum required contribution for 2004 as of 12/31/2004 is:

$$4,283 - (2,305 \times 1.07) = 1,817$$

Answer is C.

Question 27

Under the individual level premium method, each layer of benefit formula is funded as normal cost from the date it first became effective.

$$\begin{aligned} NC_{1/1/1991 \text{ formula}} &= 20 \times 37 \text{ years of service} \times 12 \ddot{a}_{62}^{(12)} \times v^{27} \div \ddot{a}_{\overline{27}|} \\ &= 20 \times 37 \times 12 \times 9.873 \times .1609 \div 12.8558 \\ &= 1,097 \end{aligned}$$

The formula effective 1/1/2002 increases the benefit by \$5 per month per year of service.

$$\begin{aligned} \text{Increase in } NC_{1/1/2002 \text{ formula}} &= 5 \times 37 \text{ years of service} \times 12 \ddot{a}_{62}^{(12)} \times v^{16} \div \ddot{a}_{\overline{16}|} \\ &= 5 \times 37 \times 12 \times 9.873 \times .3387 \div 10.1079 \\ &= 734 \end{aligned}$$

The formula effective 1/1/2004 increases the benefit by another \$5 per month per year of service.

$$\begin{aligned} \text{Increase in } NC_{1/1/2004 \text{ formula}} &= 5 \times 37 \text{ years of service} \times 12 \ddot{a}_{62}^{(12)} \times v^{14} \div \ddot{a}_{\overline{14}|} \\ &= 5 \times 37 \times 12 \times 9.873 \times .3878 \div 9.3577 \\ &= 908 \end{aligned}$$

$$\text{Total normal cost as of 1/1/2004} = 1,097 + 734 + 908 = 2,739$$

Answer is E.

Note: Be careful to notice that the assumed retirement age is 62.

Question 28

The normal cost for 2003 must first be determined. In the aggregate cost method, the normal cost is calculated using the following:

$$NC = \frac{\text{PVFB - Actuarial assets}}{\text{Present value of future salary/Annual salary}}$$

The actuarial value of assets are reduced by any credit balance and increased by any funding deficiency in the funding standard account for purposes of minimum finding.

$$NC_{1/1/2003} = \frac{10,000,000 - (2,000,000 + 500,000)}{50,000,000/7,500,000} = 1,125,000$$

The waived funding deficiency for 2003 was equal to:

$$2003 \text{ waived deficiency} = (1,125,000 + 500,000) \times 1.08 = 1,755,000$$

Since there were no gains or losses in 2003 (and there were no retirees or terminated participants), the normal cost for 2004 increases with the salary scale.

$$NC_{1/1/2004} = 1,125,000 \times 1.04 = 1,170,000$$

The waived deficiency is amortized over a 5-year period, using an interest rate equal to the greater of 150% of the Federal mid-term rate, or the plan valuation rate. In this case, the plan valuation rate of 8% is greater.

$$\begin{aligned} 2004 \text{ minimum as of } 12/31/2004 &= (1,170,000 + 1,755,000/\ddot{a}_{\overline{5}|,0.08}) \times 1.08 \\ &= (1,170,000 + 406,992) \times 1.08 = 1,703,151 \end{aligned}$$

Answer is C.

Question 29

The automatic approval to unit credit in section 3.01 of Revenue Procedure 2000-40 is not granted if the plan is a cash balance plan. See section 3.01(1) of the procedure. Statement I is false.

In general, the actuarial cost method cannot be changed using the automatic approvals if it has been changed in any of the past 4 years. However, there are some specific changes in section 4 of the Revenue Procedure that are allowed regardless of when the cost method was last changed. Statement II is false.

Any actuarial method of valuing assets must require that the actuarial value of assets not exceed 120% of the market value of the assets. See IRS regulation 1.412(c)(2)-1(b)(6) and section 3.15 of the Revenue Procedure. Statement III is true.

Answer is E.

Question 30

A new 10-year amortization base must be set up due to the change in asset valuation method.

Average of book and market value = $(350,000 + 570,000)/2 = 460,000$

Market value = 350,000

120% of market value = $1.2 \times 350,000 = 420,000$

The asset value under the old method would have been \$420,000, and under the new method is \$350,000. The assets decrease by \$70,000 due to the method change. This increases unfunded liabilities, resulting in a new \$70,000 charge base.

The only other amortization base is the initial unfunded liability. The balance equation can be used to determine the unfunded liability.

Unfunded liability = Outstanding balance – Credit balance

$$\begin{aligned} &= (350,000 \times \frac{\ddot{a}_{\overline{16}|}}{\ddot{a}_{\overline{30}|}}) + 70,000 - 43,000 \\ &= 266,445 + 70,000 - 43,000 = 293,445 \end{aligned}$$

The normal cost under frozen initial liability is calculated using the following formula:

$$NC = \frac{PVFB - \text{Actuarial assets} - \text{Unfunded liability}}{\text{Present value of future salary}/\text{Annual salary}}$$

Note that the actuarial value of assets is not adjusted by the credit balance in this cost method.

$$NC_{1/1/2004} = \frac{1,800,000 - 350,000 - 293,445}{4,000,000/600,000} = 173,483$$

The minimum required contribution for 2004 as of 12/31/2004 is:

$$\begin{aligned} &(173,483 + 350,000/\ddot{a}_{\overline{30}|} + 70,000/\ddot{a}_{\overline{10}|} - 43,000) \times 1.07 \\ &= (173,483 + 26,360 + 9,314 - 43,000) \times 1.07 = 177,788 \end{aligned}$$

Answer is B.

Question 31

When using the smoothed value method (see Revenue Procedure 2000-40, section 3.15), the actuarial value of assets is equal to the market value of assets as of the valuation date, less a fraction of the gain (or plus a fraction of the loss) for each prior year (up to 4 years). The fraction decreases for each year's gain or loss. With a 5-year smoothing period, the additions or subtractions to the current year's market value are:

- (i) 4/5 of the prior year's gain or loss
- (ii) 3/5 of the second prior year's gain or loss
- (iii) 2/5 of the third prior year's gain or loss
- (iv) 1/5 of the fourth prior year's gain or loss

The gain or loss is determined as the difference between the actual gain or loss and the expected gain or loss (using the valuation interest rate to determine the expected gain or loss). Either simple interest or compound interest can be used to determine the expected gain or loss. Simple interest will be used in this solution.

Since the method is being use with a phase-in, in the first year (2002) the actuarial value of assets is the market value of assets. In the second year (2003), the actuarial value of assets is equal to the market value of assets plus or minus 4/5 of the prior year's gain or loss. In the third year (2004), the actuarial value of assets is equal to the market value of assets plus or minus 4/5 of the prior year's gain or loss, plus or minus 3/5 of the second prior year's gain or loss.

The market value of assets as of 1/1/2004 is:

$$\$4,100,000 + \$250,000 - \$250,000 + \$500,000 = \$4,600,000$$

The expected market value as of 1/1/2004 is:

$$(\$4,100,000 \times 1.07) + (\$250,000 \times 1.035) - (\$250,000 \times 1.035) = \$4,387,000$$

$$2003 \text{ asset gain} = \$4,600,000 - \$4,387,000 = \$213,000$$

The expected market value as of 1/1/2003 is:

$$(\$5,000,000 \times 1.07) + (\$200,000 \times 1.035) - (\$300,000 \times 1.035) = \$5,246,500$$

$$2002 \text{ asset loss} = \$5,246,500 - \$4,100,000 = \$1,146,500$$

$$1/1/2003 \text{ smoothed market value} = \$4,100,000 + (4/5 \times \$1,146,500) = \$5,017,200$$

$$\begin{aligned} 1/1/2004 \text{ smoothed market value} &= \$4,600,000 - (4/5 \times \$213,000) + (3/5 \times \$1,146,500) \\ &= \$5,117,500 \end{aligned}$$

The 1/1/2003 smoothed value must be reduced to \$4,920,000, since that is 120% of the market value of assets.

The difference in the two actuarial asset values is:

$$\$5,117,500 - \$4,920,000 = \$197,500$$

Answer is B.

Question 32

Plan amendments adopted by the valuation date that are pursuant to a collective bargaining agreement are taken into account for that valuation, to the extent that the amendment applies to the participants. Smith will reach normal retirement on 1/1/2006, and will be subject to the \$50 per month benefit formula at that time. Brown will reach normal retirement on 1/1/2015, and will be subject to the \$60 per month benefit formula at that time. Those are the benefit formulas that are to be used for each participant.

When the fresh start approach is used in an immediate gain method to determine the deductible limit, the amortization base is equal to the unfunded accrued liability. The fresh start base is amortized over 10 years under IRC section 404. The accrued liability in the unit credit method is the present value of the accruals due to past service.

$$AL_{\text{Smith}} = \$50 \times 12 \times 28 \text{ years} \times \ddot{a}_{65}^{(12)} \times v^2 = \$16,800 \times 9.24 \times .8734 = \$135,580$$

$$AL_{\text{Brown}} = \$60 \times 12 \times 20 \text{ years} \times \ddot{a}_{65}^{(12)} \times v^{11} = \$14,400 \times 9.24 \times .4751 = \$63,215$$

$$AL_{\text{Total}} = \$135,580 + \$63,215 = \$198,795$$

$$\text{Fresh start base} = AL - \text{Actuarial assets} = \$198,795 - \$150,000 = \$48,795$$

The normal cost in the unit credit method is the present value of the current year accrual.

$$NC_{\text{Smith}} = \$50 \times 12 \times \ddot{a}_{65}^{(12)} \times v^2 = \$600 \times 9.24 \times .8734 = \$4,842$$

$$NC_{\text{Brown}} = \$60 \times 12 \times \ddot{a}_{65}^{(12)} \times v^{11} = \$720 \times 9.24 \times .4751 = \$3,161$$

$$NC_{\text{Total}} = \$4,842 + \$3,161 = \$8,003$$

The deductible limit is equal to the greater of the minimum required contribution or the normal cost plus limit adjustment. Due to the fact that the credit balance is so large (it exceeds the normal cost), the normal cost plus limit adjustment is clearly larger than the minimum required contribution.

$$\text{Deductible limit for 2004} = (8,003 + 48,795/\ddot{a}_{10}) \times 1.07 = (8,003 + 6,493) \times 1.07 = 15,511$$

Answer is D.

Question 33

The gain or loss is equal to the difference between the actual value of the retirement benefit and the expected accrued liability under the cost method (had the participant not retired early).

Smith has retired with 25 years of service at age 59. The accrued benefit, reduced 11/30 (1/15 for 5 years and 1/30 for 1 year) due to early retirement, is:

$$AB = 2\% \times 25 \text{ years} \times \frac{100,000 + 108,000 + 91,000}{3} \times 19/30 = \$31,561$$

Note that the average salary is defined to be the high 3 years in the last 5 before retirement, and there is no requirement that these 3 years be consecutive.

The present value of the early retirement benefit is:

$$PV = \$31,561 \times \ddot{a}_{59}^{(12)} = \$31,561 \times 10.85 = 342,437$$

Under the unit credit cost method, the accrued liability (if Smith had not retired early) is equal to the present value of the accrual from past years. Since the assumed retirement age is 60, the early retirement reduction would be 5/15 (1/15 for 5 years). For purposes of averaging salary, projected salary must be taken into account, using the salary scale. The accrued liability is:

$$\begin{aligned} AL &= 2\% \times 25 \text{ years} \times \frac{(100,000 \times 1.035) + 100,000 + 108,000}{3} \times 10/15 \times \ddot{a}_{60}^{(12)} \times v \\ &= 50\% \times 103,833 \times 10/15 \times 10.12 \times .9346 = 327,349 \end{aligned}$$

$$\text{Loss due to early retirement} = 342,437 - 327,349 = 15,088$$

Answer is C.

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, plus the one-year term cost for the death benefit. Smith is age 63 as of the valuation date, and Jones is age 64. Note that the salary scale must be used to increase salary to the year before retirement in order to determine final salary.

Retirement benefit normal cost:

$$\begin{aligned}\text{Smith: } & 2\% \times \$50,000 \times 1.03^2 \times \ddot{a}_{65}^{(12)} \times v^2 \times {}_2p_{63} \\ & = 2\% \times \$50,000 \times 1.03^2 \times 9.24 \times .8734 \times .96 \times .98 \\ & = \$8,055\end{aligned}$$

$$\begin{aligned}\text{Jones: } & 2\% \times \$70,000 \times 1.03 \times \ddot{a}_{65}^{(12)} \times v \times p_{64} \\ & = 2\% \times \$70,000 \times 1.03 \times 9.24 \times .9346 \times .96 \\ & = \$11,955\end{aligned}$$

The one-year term cost for the death benefit is:

$$\begin{aligned}\text{Smith: } & \$50,000 \times v \times q_{63} = \$50,000 \times .9346 \times .02 = \$935 \\ \text{Jones: } & \$50,000 \times v \times q_{64} = \$50,000 \times .9346 \times .04 = \$1,869\end{aligned}$$

$$\text{Total normal cost} = 8,055 + 11,955 + 935 + 1,869 = 22,814$$

$$\begin{aligned}\text{Total charges to 2004 funding standard account} \\ \text{as of 12/31/2004} & = (22,814 + 30,000) \times 1.07 = 56,511\end{aligned}$$

$$\begin{aligned}\text{Total credits to 2004 funding standard account} \\ \text{as of 12/31/2004} & = (10,000 + 60,000) \times 1.07 = 74,900\end{aligned}$$

$$\text{Credit balance as of 12/31/2004} = 74,900 - 56,511 = 18,389$$

Answer is D.

Question 35

The normal cost under the unit credit method is equal to the present value of the increase in the benefit accrual for the year, plus the one-year term cost for the death benefit. The participant is age 50 as of the valuation date.

Retirement benefit normal cost:

$$\$50 \times 12 \times \ddot{a}_{65}^{(12)} \times v^{15} \times {}_{15}p_{50} = \$600 \times 8.73 \times .3624 \times 826,026/952,223 = \$1,647$$

The one-year term cost for the death benefit is:

$$\$35,000 \times v \times q_{50} = \$35,000 \times .9346 \times (1 - 947,695/952,223) = \$156$$

$$\text{Total normal cost} = 1,647 + 156 = 1,803$$

The accrued liability under the unit credit method is equal to the present value of the past benefit accruals.

$$\begin{aligned} \text{AL} &= \$50 \times 12 \times 10 \text{ years of service} \times \ddot{a}_{65}^{(12)} \times v^{15} \times {}_{15}p_{50} \\ &= \$6,000 \times 8.73 \times .3624 \times 826,026/952,223 = \$16,467 \end{aligned}$$

The accrued liability is amortized over 30 years.

The minimum required contribution for 2004 as of 12/31/2004 is:

$$(1,803 + 16,467/\ddot{a}_{30}) \times 1.07 = (1,803 + 1,240) \times 1.07 = 3,256$$

Answer is C.

Question 36

The contribution in 2003 was equal to the deductible limit. This is the normal cost plus a 10-year amortization of the initial unfunded liability.

$$\text{2003 contribution} = (95,000 + 950,000/\ddot{a}_{10}) \times 1.07 = (95,000 + 126,410) \times 1.07 = 236,909$$

The minimum funding requirement for 2003 is:

$$(95,000 + 950,000/\ddot{a}_{30}) \times 1.07 = (95,000 + 71,549) \times 1.07 = 178,207$$

The credit balance in the 2003 funding standard account is equal to the difference between the 2003 contribution and the minimum required contribution.

$$\text{CB}_{12/31/2003} = 236,909 - 178,207 = 58,702$$

The unfunded liability (before the plan amendment) as of 1/1/2004 is equal to the accumulated value of the unfunded liability plus normal cost from 1/1/2003, less the contribution for 2003.

$$\text{UL}_{1/1/2004} = [(950,000 + 95,000) \times 1.07] - 236,909 = 881,241$$

The unfunded liability increases by 15% due to the plan amendment, resulting in a new 30-year amortization base of 132,186 (15% of 881,241).

The adjusted unfunded liability after the plan amendment is:

$$\text{Adjusted UL}_{1/1/2004} = 881,241 + 132,186 = 1,013,427$$

The deductible limit for 2004 is determined as of the end of the year. Note that the new plan amendment base is amortized over 10 years for the limit adjustment.

$$\begin{aligned} \text{2004 deductible limit} &= (100,000 + 950,000/\ddot{a}_{\overline{10}|} + 132,186/\ddot{a}_{\overline{10}|}) \times 1.07 \\ &= (100,000 + 126,410 + 17,589) \times 1.07 = 261,079 \end{aligned}$$

Note that although the contribution is made on the first day of the year, it is equal to \$261,079, the deductible limit for 2004. The timing of the contribution does not have an effect on the deductible limit.

The minimum funding requirement (without regard to the credit balance) for 2004 is:

$$(100,000 + 950,000/\ddot{a}_{\overline{30}|} + 132,186/\ddot{a}_{\overline{30}|}) \times 1.07 = (100,000 + 71,549 + 9,956) \times 1.07 = 194,210$$

The credit balance in the 2004 funding standard account is equal to the difference between the sum of the accumulated 2004 contribution and the credit balance from 2003, and the minimum required contribution.

$$\text{CB}_{12/31/2004} = [(261,079 + 58,702) \times 1.07] - 194,210 = 147,956$$

Answer is C.

Question 37

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 1/1/2004, this is:

$$82\% = (2,950,000 - 80,000)/3,500,000$$

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).

$$\text{Unfunded current liability} = 3,500,000 - (2,950,000 - 80,000) = 630,000$$

The amortization of the unfunded old liability is:

$$\text{Unfunded old liability amount} = 100,000/\ddot{a}_{\overline{3}|,0.065} = 35,453$$

It is assumed that there are no unpredictable contingent event liabilities (this is given in the general conditions of the exam). Therefore, the unfunded new liability is equal to the unfunded current liability less the unfunded old liability.

$$\text{Unfunded new liability} = 630,000 - 100,000 = 530,000$$

The applicable percentage that applies to the unfunded new liability using the given formula is:
 $30\% - [(82\% - 60\%) \times .4] = .212$

$$\text{Unfunded new liability amount} = 530,000 \times .212 = 112,360$$

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 2004 due to the additional accrual for the year. This is:

$$\text{DRC} = 35,453 + 112,360 + 30,000 = 177,813$$

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

$$177,813 - (30,000 + 45,000) = 102,813$$

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

$$102,813 \times 1.065 = 109,496$$

Note that this amount would be reduced if there had been less than 150 participants in the 2003 plan year.

Answer is C.

Question 38

The minimum required contribution for 2003 (normal cost plus net amortization charges less credit balance, increased with interest to the end of the year) as of 12/31/2003 is:

$$(12,000 + 5,000 - 2,000) \times 1.07 = 16,050$$

The credit balance as of 12/31/2003 is equal to the excess of the contribution for 2003 with interest to 12/31/2003 over the minimum required contribution for 2003. Since the contribution was made after the end of the year, it receives no interest.

$$\text{CB}_{12/31/2003} = 19,000 - 16,050 = 2,950$$

Note that the full funding limitation can be checked for 2003, but it is clear that it will not apply since the accrued liability exceeds the smaller of the actuarial or market value of assets by an amount greater than the net amortization charges.

The 2003 experience gain or loss must be determined.

$$\begin{aligned} \text{Expected unfunded liability} &= [(UAL_{1/1/2003} + NC_{1/1/2003}) \times 1.07] - \text{Contribution}_{2003} \\ &= [(85,000 - 78,000 + 12,000) \times 1.07] - 19,000 \\ &= 1,330 \end{aligned}$$

$$\begin{aligned} \text{Actual unfunded liability} &= AL_{1/1/2004} - \text{Actuarial assets}_{1/1/2004} \\ &= 90,000 - 85,000 = 5,000 \end{aligned}$$

$$2003 \text{ Loss} = 5,000 - 1,330 = 3,670$$

The minimum required contribution for 2004 as of 12/31/2004 is:

$$(11,000 + 5,000 + 3,670/\ddot{a}_{\overline{5}|} - 2,950) \times 1.07 = (11,000 + 5,000 + 837 - 2,950) \times 1.07 = 14,859$$

Again, the full funding limitation will not apply since the accrued liability exceeds the smaller of the actuarial or market value of assets by an amount greater than the net amortization charges.

The funding deficiency is \$14,859. The initial excise tax is 10% of this amount.

$$\text{Excise tax} = 10\% \times \$14,859 = \$1,486$$

Answer is D.

Question 39

The amortization period can be extended by no more than 10 years (see IRC section 412(e)). The interest rate used to amortize any base with an extension is equal to the greater of the valuation interest rate or 150% of the Federal mid-term rate. In this case, the valuation rate of 7% is greater.

The initial accrued liability has been amortized over 30 years. There are 22 years left to amortize it in 2004. With the additional 10-year extension granted, the outstanding balance would be amortized over 32 years.

$$\text{Outstanding balance as of 1/1/2004} = 65,000 \ddot{a}_{\overline{22}|0.07} = 769,309$$

$$\text{New amortization as of 1/1/2004} = 769,309/\ddot{a}_{\overline{32}|0.07} = 56,852$$

$$\begin{aligned}\text{Decrease in funding standard account charges as of 12/31/2004} &= (65,000 - 56,852) \times 1.07 \\ &= 8,718\end{aligned}$$

Answer is C.

Question 40

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 1/1/2004, this is:

$$69.23\% = (1,000,000 - 100,000)/1,300,000$$

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).

$$\text{Unfunded current liability} = 1,300,000 - (1,000,000 - 100,000) = 400,000$$

Since the plan was effective after 1989, there is no unfunded old liability. It is assumed that 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:
 $30\% - [(69.23\% - 60\%) \times .4] = .26308$

$$\text{The unfunded new liability amount is: } 400,000 \times .26308 = 105,232$$

The Deficit Reduction Contribution (DRC) is equal to the sum of the unfunded new liability amount and the expected increase in current liability for 2004 due to the additional accrual for the year. This is:

$$\text{DRC} = 105,232 + 150,000 = 255,232$$

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

$$255,232 - (125,000 + 50,000) = 80,232$$

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

$$80,232 \times 1.06 = 85,046$$

Note that this amount would be reduced if there had been less than 150 participants in the 2003 plan year.

The minimum required contribution for 2004 as of 12/31/2004 is:

$$[(125,000 + 50,000 - 100,000) \times 1.07] + 85,046 = 165,296$$

Answer is D.

Question 41

The minimum required contribution for 2004 as of 12/31/2004 is:

$$\begin{aligned} & (40,000 + 500,000/\ddot{a}_{\overline{30}|} + 15,000/\ddot{a}_{\overline{5}|} - 20,000/\ddot{a}_{\overline{5}|} - 25,000/\ddot{a}_{\overline{5}|} + 50,000/\ddot{a}_{\overline{30}|} - 10,000) \times 1.07 \\ & = (40,000 + 37,657 + 3,419 - 4,559 - 5,698 + 3,766 - 10,000) \times 1.07 \\ & = 69,106 \end{aligned}$$

Answer is C.

Question 42

The funding standard account balance has not been provided as of 12/31/2003. This can be determined from the given information.

$$2003 \text{ funding standard account charges} = (460,000 + 280,000) \times 1.07 = 791,800$$

$$2003 \text{ funding standard account credits} = (50,000 \times 1.07) + 900,000 = 953,500$$

$$\text{Credit balance in funding standard account as of 12/31/2003} = 953,500 - 791,800 = 161,700$$

The actuarial cost method has changed as of 1/1/2004. A new amortization base due to the change in cost method must be determined and is equal to the difference between the unfunded liability under the new method and the unfunded liability under the old method. The old method is frozen initial liability. In general, the only amortization base under the frozen initial liability method is the initial liability. The plan has been in existence for 7 years, so there are 23 years remaining to fully amortize the initial base. The outstanding balance of the base is:

$$\text{Outstanding balance}_{1/1/2004} = 280,000 \times \ddot{a}_{\overline{23}|} = 3,377,147$$

The balance equation can be used to determine the unfunded liability.

$$\text{Unfunded liability} = \text{Outstanding balance} - \text{Credit balance} = 3,377,147 - 161,700 = 3,215,447$$

The unfunded liability under the entry age normal method is equal to the unfunded accrued liability.

$$\text{Unfunded accrued liability} = 4,750,000 - 1,750,000 = 3,000,000$$

$$\text{New amortization base} = 3,000,000 - 3,215,447 = <215,447>$$

This base is amortized over a 10-year period for both minimum funding and the deductible limit (limit adjustment under IRC section 404(a)(1)(A)(iii)). The deductible limit is equal to the greater of the minimum funding requirement or the normal cost plus limit adjustment. Since the credit balance is so large, it is clear that the larger of these will be the normal cost plus limit adjustment. It is necessary to determine the original amount of the base in order to calculate the limit adjustment.

$$\text{Original amortization base} = 280,000 \times \ddot{a}_{30|} = 3,717,749$$

$$\begin{aligned} \text{2004 deductible limit} &= (520,000 + 3,717,749/\ddot{a}_{10|} - 215,447/\ddot{a}_{10|}) \times 1.07 \\ &= (520,000 + 494,695 - 28,668) \times 1.07 = 1,055,049 \end{aligned}$$

Answer is D.

Question 43

A waived funding deficiency is amortized each year using the greatest of 150% of the Federal mid-term rate or the valuation interest rate. There is a waived funding deficiency as of 12/31/2001. The amortization of this will begin in 2002. In 2002, the largest of the interest rates is the valuation interest rate. In 2003, the largest of the interest rates remains the valuation interest rate.

The reconciliation account item for the waived funding deficiency results from the amortization of that base using an interest rate other than the valuation interest rate. This is not the case prior to 2004, since the valuation interest rate has always been used to amortize the waived deficiency. Therefore, the waived deficiency does not enter into the determination of the reconciliation account balance as of 1/1/2004.

The only other reconciliation account items are the additional funding charge and the late quarterly interest charge. These items accumulate in the reconciliation account from the end of the year that they are charged to the funding standard account using the valuation interest rate.

$$\text{Reconciliation account balance}_{1/1/2004} = (20,000 \times 1.07) + (25,000 \times 1.07) + 27,000 = 75,150$$

Answer is D.

Question 44

There is no funding standard account information given in this question, so it is clear that the deductible limit must be based upon the normal cost plus the limit adjustment (IRC section 404(a)(1)(A)(iii)). The limit adjustment is the 10-year amortization of the initial unfunded liability. In addition, to determine the deductible limit when the plan year and the fiscal year are different, interest is given to the earlier of the plan year end (12/31/2004 in this case) and the fiscal year end (9/30/2004). (See IRS regulation 1.404(a)-14(f)(3).) Note that the 2004 plan year is used because that is the plan year that begins in the fiscal year. The earlier of the two dates is the fiscal year end of 9/30/2004. So, only 9 months of interest is credited. This can be done using either simple or compound interest. Compound interest will be used in this solution.

$$\begin{aligned}\text{Deductible limit}_{9/30/2004} &= (1,400,000 + 4,000,000/\ddot{a}_{\overline{10}|}) \times 1.07^{3/4} \\ &= (1,400,000 + 532,252) \times 1.07^{3/4} = 2,032,833\end{aligned}$$

Answer is C.

Question 45

The expected assets as of 1/1/2004 are:

$$\text{Expected assets} = (450,000 \times 1.07) + 80,000 - (20,000 \times 1.07) = 540,100$$

The asset loss is equal to the difference between the actual and expected assets.

$$\text{Asset loss} = 540,100 - 520,000 = 20,100$$

The loss is amortized under the aggregate method as a percentage of future compensation.

$$\text{Increase in normal cost} = 20,100 \div (9,600,000/1,200,000) = 2,513$$

Answer is A.