Solutions to EA-2(A) Examination
Fall, 2001

Question 1

The expected unfunded liability is:

$$\begin{aligned} eUL &= (AL_{1/1/2000} + \text{Normal cost}_{1/1/2000} - \text{Actuarial assets}_{1/1/2000}) \times 1.07 \\ &\quad - \text{Contribution}_{2000} \\ &= (800{,}000 + 50{,}000 - 400{,}000) \times 1.07 - 54{,}000 \\ &= 427{,}500 \end{aligned}$$

The actual unfunded liability is:

$$\begin{aligned} UL &= AL_{1/1/2001} - \text{Actuarial assets}_{1/1/2001} \\ &= 950{,}000 - 500{,}000 \\ &= 450{,}000 \end{aligned}$$

Experience Loss = 450,000 – 427,500 = 22,500

Answer is A.

Question 2

The outstanding balance of the amortization bases as of 1/1/2001 is:

$$20{,}000\,\ddot{a}_{\overline{8}|} + 5{,}000\,\ddot{a}_{\overline{4}|} - 4{,}000\,\ddot{a}_{\overline{5}|} = 127{,}786 + 18{,}122 - 17{,}549 = 128{,}359$$

The late interest charge for 2000 is added to the reconciliation account balance, bringing the balance to $4,200 as of 12/31/2000. Note that there is no interest credit on the $4,200 since it is already an end of year charge.

Using the balance equation,

$$\begin{aligned} &\text{Unfunded balance} = \text{Outstanding balance} - \text{Credit balance} \\ &\qquad\qquad - \text{Reconciliation account balance} \\ &(1{,}700{,}000 - 1{,}600{,}000) = 128{,}359 - \text{Credit balance} - 4{,}200 \\ &\text{Credit balance} = 24{,}159 \end{aligned}$$

Answer is B.

Question 3

The required quarterly contribution for 2001 is equal to 25% of the smaller of the 2000 minimum required contribution (as of 12/31/2000) or 90% of the 2001 minimum required contribution (as of 1/1/2001). Clearly this is:

$$125{,}000 \times .9 \times .25 = 28{,}125$$

The funded current liability percent as of 1/1/2001 is:

$$\text{Actuarial assets/Current liability} = 400{,}000/900{,}000 = 44.44\%$$

Adjusted disbursements are equal to the plan disbursements made during the one-year period ending on March 31, 2001, reduced by the product of the funded current liability percentage and the sum of the disbursements used to pay single lump sums and purchase annuities. The adjusted disbursements are:

$$(150{,}000 + 25{,}000 + 10{,}000 + 10{,}000) - .4444 \times (25{,}000 + 10{,}000) = 179{,}446$$

The liquidity shortfall is equal to three times the adjusted disbursements, less the market value of the assets as of March 31, 2001:

$$(3 \times 179{,}446) - 420{,}000 = 118{,}338$$

The quarterly contribution payable on 4/15/2001, including the liquidity shortfall, is equal to the greater of the liquidity shortfall and the quarterly contribution requirement, which is $118,338.

Answer is C.

Question 4

The original amount of the amortization base was:

$$100{,}000\,\ddot{a}_{\overline{30}|} = 1{,}327{,}767$$

The outstanding balance of the amortization base is:

$$100{,}000\,\ddot{a}_{\overline{24}|} = 1{,}227{,}219$$

Using the balance equation,

$$\begin{aligned}\text{Unfunded balance} &= \text{Outstanding balance} - \text{Credit balance} \\ &\quad - \text{Reconciliation account balance} \\ &= 1{,}227{,}219 - 150{,}000 \\ &= 1{,}077{,}219\end{aligned}$$

Under the frozen initial liability method, the normal cost (as of 1/1/2001) is equal to:

$$\begin{aligned}NC &= \frac{PVFB - \text{Actuarial assets} - \text{Unfunded balance}}{PVFS/\text{Salary}} \\ &= \frac{8{,}500{,}000 - 1{,}750{,}000 - 1{,}077{,}219}{30{,}000{,}000/1{,}500{,}000} \\ &= 283{,}639\end{aligned}$$

Note that the assets are not adjusted by subtracting the credit balance under this method.

The deductible limit for 2001 is:

$$(283{,}639 + 1{,}327{,}767/\ddot{a}_{\overline{10}|}) \times 1.07 = (283{,}639 + 176{,}677) \times 1.07 = 492{,}538$$

Answer is E.

Question 5

For Plan A, the unfunded balance as of 1/1/2001 is:

$$\begin{aligned}\text{Unfunded balance} &= \text{Outstanding balance} - \text{Credit balance} \\ &\quad - \text{Reconciliation account balance} \\ &= 150{,}000 + 60{,}000 - 20{,}000 \\ &= 190{,}000\end{aligned}$$

For purposes of allocating the amortization bases between plans, an accrued liability under the frozen initial liability must be determined, as described in Revenue Ruling 81-212. This is:

$$\begin{aligned}\text{FIL AL} &= \text{Unfunded balance} + \text{Actuarial assets (unreduced by credit balance)} \\ &= 190{,}000 + (385{,}000 + 20{,}000) \\ &= 595{,}000\end{aligned}$$

The amortization bases are allocated to Plans B and C as follows:

	Plan A	Plan B	Plan C
(1) Entry age normal accrued liability	$600,000	$250,000	$350,000
(2) FIL accrued liability (allocated in proportion to (1))	595,000	247,917	347,083
(3) Actuarial assets less credit balance	385,000	128,000	257,000
(4) Outstanding balance ((2) – (3))	210,000	119,917	90,083
(5) Initial unfunded liability (allocated in proportion to (4))	150,000	85,655	64,345
(6) Assumption change increase (allocated in proportion to (4))	60,000	34,262	25,738

The total amortization payment for Plan C as of 1/1/2001 is:

$$64{,}345/\ddot{a}_{\overline{19}|} + 25{,}738/\ddot{a}_{\overline{4}|} = 5{,}818 + 7{,}101 = 12{,}919$$

Answer is B.

Question 6

Under IRC section 412(c)(2)(A), any reasonable actuarial method of asset valuation must take into account fair market value. Regulation 1.412(c)(2)-1(b)(4) requires that the actuarial value of assets take into account fair market value of the assets. Regulation 1.412(c)(2)-1(b)(5) requires that the method of determining the actuarial value of assets must not consistently result in a value either above or below fair market value. Regulation 1.412(c)(2)-1(b)(6) requires that the actuarial value of assets be within 80% and 120% of fair market value. Regulation 1.412(c)(2)-1(b)(9) provides examples of methods that can be used in the determination of actuarial value of assets. Each of the three descriptions given in the question can be compared to these examples.

I. This method is similar to that of example (7). It takes into account fair market value and will not necessarily return values always above or below fair market value. This is an acceptable method.
II. This method is similar to that of example (2). This is an acceptable method.
III. This method is a variation of the method described in example (6) and is an acceptable method.

Answer is E.

Question 7

Note that since there is a salary scale, the funding method in this question is technically projected unit credit.

Step I: Determine the (gain)/loss due to asset experience.

The benefit payment of $20,000 to Jones must be subtracted from the 1/1/2000 market value of assets in order to determine the expected asset value.

Expected assets = (225,000 – 20,000) × 1.07 + 8,000 = 227,350
Actual assets = 226,000
Loss = 227,350 – 226,000 = 1,350

Step II: Determine the (gain)/loss due to mortality.

Since there are no pre-retirement mortality decrements and Smith is still alive, there is no gain or loss due to mortality for Smith. The gain or loss can be calculated for Jones.

Jones expected accrued liability = $(20{,}000\,\ddot{a}_{65} - 20{,}000) \times 1.07 = 162{,}169$
Jones actual accrued liability = 164,000
Loss = 164,000 – 162,169 = 1,831

Step III: Determine the (gain)/loss due to compensation increases.

Only Smith will have a gain or loss due to compensation increases. Based upon Smith's expected 2000 salary, the final average salary for Smith is:

$$75{,}000 \times \frac{1.06^6 + 1.06^7 + 1.06^8}{3} = 112{,}900$$

Expected accrued liability = $1\% \times 112{,}900 \times 21 \text{ years} \times \ddot{a}_{65} \times v^8 = 118{,}367$
Actual accrued liability = 119,500
Loss = 119,500 – 118,367 = 1,133

Step IV: Summary

Placing the results in order from smallest to largest,

Loss from compensation increases < asset loss < mortality loss

Answer is D.

Question 8

The initial unfunded liability under the frozen initial liability method is equal to the difference between the entry age normal accrued liability and the actuarial value of assets (unadjusted by the credit balance).

Initial unfunded liability = 202,000 – 123,000 = 79,000

The normal cost (as of 1/1/2001) is equal to:

$$NC = \frac{\text{PVFB - Actuarial assets - Unfunded balance}}{\text{PVFS / Salary}}$$
$$= \frac{241{,}000 - 123{,}000 - 79{,}000}{494{,}000 / 60{,}000}$$
$$= 4{,}737$$

In order to determine the minimum funding requirement, it is necessary to look at the balance equation:

Unfunded balance = Outstanding balance – Credit balance
- Reconciliation account balance

Substituting,

79,000 = Outstanding balance – 5,000
Outstanding balance = 84,000

The outstanding balance of the amortization base attributable to the change in funding method must be amortized over 10 years for minimum funding purposes, per Revenue Procedure 2000-40.

The minimum required contribution for 2001 as of 12/31/2001 is:

$$(4{,}737 + 84{,}000/\ddot{a}_{\overline{10}|} - 5{,}000) \times 1.07 = (4{,}737 + 11{,}177 - 5{,}000) \times 1.07 = 11{,}678$$

Answer is C.

Question 9

5% of the 200 participants, or 10 people, were expected to terminate in 2000. Only 3 actually terminated, leaving a loss equal to the present value of the 2000 accrual for the 7 people who didn't terminate as expected.

$$\text{Loss} = \$40 \times 12\,\ddot{a}_{65}^{(12)} \times v^{24} \times 7 \text{ people} = 6{,}624$$

Answer is B.

Question 10

A plan is exempt from the additional funding charge if the gateway percent as of 1/1/2001 is at least 90%, or if the gateway percent as of 1/1/2001 is at least 80% and the gateway percent in any two consecutive of the past three years was at least 90%. The gateway percent is the ratio of the actuarial value of assets (unadjusted by the credit balance) to the current liability (using the maximum permitted interest rate).

Plan A: 790,000/1,000,000 = 79%
⇒ Not exempt, since gateway percent is not at least 80%.

Plan B: 890,000/1,000,000 = 89%
⇒ Not exempt, since gateway percent is not at least 90% and there are not two consecutive years in the last three with gateway percentages at least 90%.

Plan C: 850,000/1,040,000 = 81.73%
⇒ Exempt, since gateway percent is at least 80% and there are two consecutive years in the last three with gateway percentages at least 90%.

Plan D: 74,000/100,000 = 74%
⇒ Not exempt, since gateway percent is not at least 80%.

Only Plan C is exempt from the additional funding charge for 2001.

Answer is B.

Note that all plans meet the 100-participant requirement since the plans are aggregated for that purpose. See IRC section 412(l)(6)(C).

Question 11

The actual return on the assets (4%) was 3% less than the expected return of 7%. The asset loss is:

$$(385{,}000 + 3{,}000) \times 3\% = 11{,}640$$

The increase in the normal cost as of 1/1/2001 due to the asset loss is:

$$\text{Asset loss} \div (\text{PVFS/Salary}) = 11{,}640 \div (12{,}000{,}000/1{,}000{,}000) = 970$$

The increase in the minimum required contribution is:

$$970 \times 1.07 = 1{,}038$$

Answer is B.

Question 12

The accrued liability and normal cost used in the full funding limitation under the aggregate funding method is based upon the entry age normal funding method, per Revenue Ruling 81-13. The normal cost and accrued liability under the entry age normal funding method as of 1/1/2001 are:

$$NC_{ean} = \$50 \times 27 \text{ years} \times 12\,\ddot{a}_{65}^{(12)} \times v^{27} \div \ddot{a}_{\overline{27}|} = 2{,}033$$

$$AL_{ean} = 2{,}033 \times \ddot{s}_{\overline{16}|} = 60{,}665$$

The full funding limitations are:

ERISA:	$(60{,}665 + 2{,}033 - 57{,}000) \times 1.07 = 6{,}097$
OBRA '87:	$(72{,}000 \times 160\%) - (57{,}000 \times 1.07) = 54{,}210$
RPA '94:	$(75{,}000 \times 90\%) - (60{,}000 \times 1.07) = 3{,}300$

Note that actuarial value of assets is used for the RPA '94 full funding limitation, rather than the smaller of the market or actuarial value.

The overall full funding limitation is the smaller of the ERISA and OBRA '87 limits, but not less than the RPA '94 limit. This is the ERISA limit of 6,097.

Answer is D.

Question 13

Step I: Calculate the minimum funding requirement based upon formula A.

The increase in the benefit formula results in an increase in the unfunded liability that must be amortized over 30 years for minimum funding. The increase in unfunded liability under the attained age normal method is equal to the increase in the unit credit accrued liability (which is the present value of accrued benefits). Under formula A, the monthly retirement benefit per year of service has increased by \$15.

$$\begin{aligned}\text{Unfunded liability increase} &= 15/50 \times \text{Present value of accrued benefits} \\ &= 15/50 \times 5{,}000{,}000 \\ &= 1{,}500{,}000\end{aligned}$$

The unfunded liability as of 1/1/2001 can be determined from the balance equation:

$$\begin{aligned}\text{Unfunded balance} &= \text{Outstanding balance} - \text{Credit balance} \\ &\quad - \text{Reconciliation account balance} \\ &= 16{,}000 \times \ddot{a}_{\overline{25}|} \\ &= 199{,}509\end{aligned}$$

The normal cost (as of 1/1/2001) is equal to:

$$\begin{aligned}NC &= \frac{\text{PVFB} - \text{Actuarial assets} - \text{Unfunded balance}}{\text{Present value of future service} / \text{Number of participants}} \\ &= \frac{(\frac{65}{50})7{,}000{,}000 - 4{,}950{,}000 - 199{,}509 - 1{,}500{,}000}{2{,}500/300} \\ &= 294{,}059\end{aligned}$$

The minimum funding requirement for 2001 as of 12/31/2001 under formula A is:

$$\begin{aligned}\text{Minimum} &= (294{,}059 + 16{,}000 + 1{,}500{,}000/\ddot{a}_{\overline{30}|}) \times 1.07 \\ &= (294{,}059 + 16{,}000 + 112{,}972) \times 1.07 \\ &= 452{,}643\end{aligned}$$

Step II: Calculate the minimum funding requirement based upon formula B.

Under formula B, the increase in the benefit formula is for future service only. Therefore, there is no new amortization base due to the plan amendment as the accrued liability under the unit credit method remains unchanged. Setting the minimum required contribution under formula A equal to the minimum under formula B,

$$452{,}643 = (NC_B + 16{,}000) \times 1.07 \quad \Rightarrow \quad NC_B = 407{,}031$$

Using the formula to determine normal cost,

$$407{,}031 = \frac{PVFB_B - 4{,}950{,}000 - 199{,}509}{2{,}500/300}$$

$$\Rightarrow \quad PVFB_B = 8{,}541{,}434$$

The present value of all benefits accrued after 2000 = 8,541,434 – 5,000,000 = 3,541,434.

Under the original formula, the present value of all benefits accrued after 2000 = 7,000,000 – 5,000,000 = 2,000,000.

Therefore, $X = $50 × (3,541,434/2,000,000) = $88.54

Answer is B.

Question 14

First, the Gateway percentage must be determined to see if the additional funding charge applies for 2001. This is based upon the actuarial value of assets (unadjusted for the credit balance) and the current liability based upon the maximum value in the applicable range.

Gateway percentage = 975,000/1,250,000 = 78%

The additional funding charge applies since the Gateway percentage is less than 80%.

The unfunded current liability for the additional funding charge is:

UCL = Current liability – (Actuarial assets – Credit balance)
= 1,300,000 – (975,000 – 25,000) = 350,000

The funded current liability percentage is:

Funded CL% = (1,300,000 – 350,000)/1,300,000 = 73.0769%

The unfunded old liability is equal to the unfunded current liability less the unfunded new liability:

Unfunded old liability = 350,000 – 240,000 = 110,000

The unfunded old liability is amortized over 6 years in 2001:

Unfunded old liability amount = $110{,}000/\ddot{a}_{\overline{6}|.061}$ = 21,150

The unfunded new liability amount is:

Unfunded new liability amount = 240,000 × [.3 - .4(73.0769% - 60%)] = 59,446

The deficit reduction contribution is:

DRC = Unfunded old liability amount + unfunded new liability amount
+ expected increase in current liability
= 21,150 + 59,446 + 60,000
= 140,596

The additional funding charge is determined by reducing the deficit reduction contribution by the funding standard account normal cost and net amortization charges, pro-rating the result for the 40 participants in excess of 100 but below 150, and increasing the result with interest to the end of the year (using the current liability interest rate).

Additional funding charge = (140,596 – 45,000 – 50,400) × (40/50) × 1.061
= 38,362

The reconciliation account as of 1/1/2002 is equal to the reconciliation account as of 1/1/2001, increased with interest at the valuation interest rate, and increased by the additional funding charge and late quarterly interest charge for 2001.

$$\text{Reconciliation account}_{1/1/2002} = (50{,}500 \times 1.07) + 38{,}362 + 800 = 93{,}197$$

Answer is D.

Question 15

Step I: Calculate the experience (gain)/loss for 2000.

It is first necessary to calculate the minimum required contribution for 2000 (based upon the valuation results of the prior actuary).

$$\text{Unfunded liability}_{1/1/2000} = 2{,}400{,}000 - 1{,}500{,}000 = 900{,}000$$
$$\text{Outstanding balance}_{1/1/2000} = \text{Unfunded balance} - \text{Credit balance} = 900{,}000$$
$$\text{Minimum}_{12/31/2000} = (162{,}000 + 900{,}000/\ddot{a}_{\overline{20}|}) \times 1.07$$
$$= (162{,}000 + 79{,}396) \times 1.07$$
$$= 258{,}294$$

$$\text{Expected unfunded}_{1/1/2001} = (2{,}375{,}000 + 165{,}000 - 1{,}500{,}000) \times 1.07 - 258{,}294$$
$$= 854{,}506$$
$$\text{Actual unfunded}_{1/1/2001} = 2{,}650{,}000 - 1{,}850{,}000 = 800{,}000$$
$$\text{2000 Gain} = 854{,}506 - 800{,}000 = 54{,}506$$

Note that the gain is based upon valuation results determined by the new actuary.

Step II: Calculate the change in the unfunded liability due to the change in actuary.

This is simply the difference in the expected accrued liability between the two actuaries.

$$\text{Expected AL (prior actuary)} = (2{,}400{,}000 + 162{,}000) \times 1.07 = 2{,}741{,}340$$
$$\text{Expected AL (new actuary)} = (2{,}375{,}000 + 165{,}000) \times 1.07 = 2{,}717{,}800$$
$$\text{Gain} = 2{,}741{,}340 - 2{,}717{,}800 = 23{,}540$$

This gain is amortized as an experience gain per Revenue Procedure 2000-40, sections 4.04(3) and (4).

Step III: Calculate the 2001 minimum required contribution.

$$\text{Minimum}_{12/31/2001} = (177{,}000 + 79{,}396 - 54{,}506/\ddot{a}_{\overline{5}|} - 23{,}540/\ddot{a}_{\overline{5}|}) \times 1.07$$
$$= (177{,}000 + 79{,}396 - 12{,}424 - 5{,}366) \times 1.07 = 255{,}308$$

Answer is C.

Question 16

The accrued liability for Smith's death benefit under the unit credit method is simply the present value of future death benefit payments based upon the accrued benefit as of 1/1/2001.

$$\text{Accrued benefit}_{1/1/2001} = 50\% \times 45{,}000 \times (23/26) = 19{,}904$$

At age 62, death is assumed to occur at the beginning of the year. An annuity to the spouse begins immediately, so there would be no interest adjustment in the present value. If death occurs at the beginning of the second year, the participant and the spouse must survive to age 63, and then the participant must die. If death occurs at the beginning of the third year, the participant and the spouse must survive to age 64, and then the participant must die.

The present value of the death benefit is:

$$\begin{aligned}
\text{PV} &= 19{,}904 \times (q_{62}\,\ddot{a}_{62}^{(12)} + vp_{62}p_{62}\,q_{63}\,\ddot{a}_{63}^{(12)} + v^2\,{}_2p_{62}\,{}_2p_{62}\,q_{64}\,\ddot{a}_{64}^{(12)}) \\
&= 19{,}904 \times [(.015)(9.80) + (.928)(1 - .015)(.017)(9.64) \\
&\qquad + (.860)(1 - .015)(1 - .017)(.019)(9.47)] \\
&= 19{,}904 \times .446627 \\
&= 8{,}890
\end{aligned}$$

Since it is assumed that only 90% of the active participants are married at the time of death,

$$\text{Accrued liability} = 8{,}890 \times .9 = 8{,}001$$

Answer is A.

Alternative solution:

It is not clear whether we are to assume that a participant remarries if their spouse dies before death. (There is no general condition for the exam that deals with this issue.) Therefore, it could be reasonable to assume that the participant remarries immediately if their spouse dies. In that case, the present value of the death benefit is:

$$\begin{aligned}
\text{PV} &= 19{,}904 \times (q_{62}\,\ddot{a}_{62}^{(12)} + vp_{62}\,q_{63}\,\ddot{a}_{63}^{(12)} + v^2\,{}_2p_{62}\,q_{64}\,\ddot{a}_{64}^{(12)}) \\
&= 19{,}904 \times [(.015)(9.80) + (.928)(.017)(9.64) \\
&\qquad + (.860)(.019)(9.47)] \\
&= 19{,}904 \times .453820 \\
&= 9{,}033
\end{aligned}$$

$$\text{Accrued liability} = 9{,}033 \times .9 = 8{,}130$$

Note that this is also within answer range A. It is not clear which is the more correct numerical answer.

Question 17

First, the Gateway percentage must be determined to see if the additional funding charge applies for 2001. This is based upon the actuarial value of assets (unadjusted for the credit balance) and the current liability based upon the maximum value in the applicable range. Since there is only one current liability value given in the question, it must be assumed (per the general conditions of the examination) that this has been determined using the maximum value in the applicable range.

Gateway percentage = 870,000/1,000,000 = 87%

The additional funding charge applies since the Gateway percentage is less than 90% and there are not two consecutive years in the last three in which the Gateway percentage was at least 90%.

The unfunded current liability for the additional funding charge is:

UCL = Current liability – (Actuarial assets – Credit balance)
= 1,000,000 – (870,000 – 0) = 130,000

The funded current liability percentage is:

Funded CL% = (870,000 – 0)/1,000,000 = 87%

There is no unfunded old liability since the plan was effective after 1995. The entire unfunded current liability is, therefore, unfunded new liability.

The unfunded new liability amount is:

Unfunded new liability amount = 130,000 × [.3 - .4(87% - 60%)] = 24,960

The deficit reduction contribution is:

DRC = Unfunded old liability amount + unfunded new liability amount
+ expected increase in current liability
= 0 + 24,960 + 40,000
= 64,960

The additional funding charge is determined by reducing the deficit reduction contribution by the funding standard account normal cost and net amortization charges. Note that under the aggregate method, there are no amortization charges.

Additional funding charge = (64,960 – 50,000)
= 14,960

The minimum funding requirement (without regard to the full funding limitation) is:

Minimum = 50,000 + 14,960 = 64,960

The full funding limitations are:

ERISA: (935,000 – 870,000) = 65,000
OBRA ’87: ((1,000,000 + 40,000) × 160%) – 870,000 = 794,000
RPA ’94: ((1,000,000 + 40,000) × 90%) – 870,000 = 66,000

The full funding limit is 66,000 (the smaller of the ERISA and OBRA ’87 limits, but not less than the RPA ’94 limit). So, the full funding limit will not apply, and the minimum funding requirement is 64,960.

The contributions are each paid on the quarterly due dates of 4/15/2001, 7/15/2001, 10/15/2001, and 1/15/2002. The contribution interest at the end of the year is:

$$\begin{aligned}\text{Contribution} &= (40{,}000 \times .07 \times (8.5/12)) + (40{,}000 \times .07 \times (5.5/12)) \\ &\quad + (40{,}000 \times .07 \times (2.5/12)) \\ &= 3{,}850\end{aligned}$$

The credit balance as of 12/31/2001 is:

$$CB = (40{,}000 \times 4) + 3{,}850 - 64{,}960 = 98{,}890$$

Answer is B.

Note: This problem was deleted from the grading of this exam as the credit balance of $0 given in the question was as of 12/31/1999 and should have been as of 12/31/2000. I have worked the solution as if the credit balance of $0 is as of 12/31/2000.

Question 18

Step I: Calculate the minimum required contribution using the original participant data.

Final average pay:

$$\text{Smith} = 30{,}000 \times \frac{1.05^{27} + 1.05^{28} + 1.05^{29}}{3} = 117{,}697$$

$$\text{Jones} = 100{,}000 \times \frac{1.05^{7} + 1.05^{8} + 1.05^{9}}{3} = 147{,}863$$

The present value of future benefits is:

$$\text{Smith} = 1\% \times 117{,}697 \times 35 \text{ years} \times \ddot{a}_{65}^{(12)} \times v^{30} = 54{,}115$$

$$\text{Jones} = 1\% \times 147{,}863 \times 30 \text{ years} \times \ddot{a}_{65}^{(12)} \times v^{10} = 225{,}498$$

$$\text{Total} = 54{,}115 + 225{,}498 = 279{,}613$$

The present value of future salary is:

$$\text{Smith} = 30{,}000 \times \ddot{a}_{\overline{30}|j} = 693{,}743$$

$$\text{Jones} = 100{,}000 \times \ddot{a}_{\overline{10}|j} = 919{,}946$$

$$\text{Total} = 693{,}743 + 919{,}946 = 1{,}613{,}689$$

Note that $j = 1.07/1.05 - 1 = .01904762$

The normal cost is:

$$\begin{aligned} NC_{1/1/2001} &= (\text{PVFB} - (\text{Assets} - \text{CB}))/(\text{PVFS/Salary}) \\ &= (279{,}613 - (50{,}000 - 20{,}000))/(1{,}613{,}689/130{,}000) \\ &= 20{,}109 \end{aligned}$$

$$NC_{12/31/2001} = 20{,}109 \times 1.07 = 21{,}517$$

Step II: Calculate the minimum required contribution using the new data for Smith.

Revised final average pay for Smith:

$$\text{Smith} = 60{,}000 \times \frac{1.05^{17} + 1.05^{18} + 1.05^{19}}{3} = 144{,}512$$

The revised present value of future benefits is:

$$\text{Smith} = 1\% \times 144{,}512 \times 25 \text{ years} \times \ddot{a}_{65}^{(12)} \times v^{20} = 93{,}362$$

$$\text{Total} = 93{,}362 + 225{,}498 = 318{,}860$$

The revised present value of future salary is:

$$\text{Smith} = 60{,}000 \times \ddot{a}_{\overline{20}|j} = 1{,}009{,}023$$

$$\text{Total} = 1{,}009{,}023 + 919{,}946 = 1{,}928{,}969$$

The normal cost is:

$$\begin{aligned} NC_{1/1/2001} &= (\text{PVFB} - (\text{Assets} - \text{CB}))/(\text{PVFS/Salary}) \\ &= (318{,}860 - (50{,}000 - 20{,}000))/(1{,}928{,}969/160{,}000) \\ &= 23{,}960 \end{aligned}$$

$$NC_{12/31/2001} = 23{,}960 \times 1.07 = 25{,}637$$

The difference in the normal costs (which is also the increase in the minimum funding requirement) is:

$$25{,}637 - 21{,}517 = 4{,}120$$

Answer is D.

Question 19

The new amortization base due to the change in interest rates is equal to the difference of the entry age normal accrued liability under the two interest assumptions. The new base is a gain base since the interest rate increased.

$$\text{New base} = 85{,}000 - 93{,}000 = (8{,}000)$$

The unfunded liability under the frozen initial liability method as of 1/1/2001 is:

$$\begin{aligned}\text{Unfunded liability}_{1/1/2001} &= (\text{Unfunded liability}_{1/1/2000} + \text{Normal cost}_{1/1/2000}) \times 1.06 \\ &\quad - \text{Contribution}_{2000} - 8{,}000 \\ &= (84{,}000 + 6{,}000) \times 1.06 - 18{,}000 - 8{,}000 \\ &= 69{,}400\end{aligned}$$

Since the fresh start alternative is adopted, the unfunded liability is amortized over 10 years for deduction purposes.

Note that the prior unfunded liability is accumulated at the old interest rate of 6%.

The assets as of 1/1/2001 are equal to the contribution for 2000 of $18,000.

The normal cost can be determined:

$$\begin{aligned}NC_{1/1/2001} &= \frac{\text{PVFB} - \text{Actuarial assets} - \text{Unfunded balance}}{\text{PVFS} / \text{Salary}} \\ &= \frac{136{,}000 - 18{,}000 - 69{,}400}{250{,}000 / 56{,}000} \\ &= 10{,}886\end{aligned}$$

The deductible limit is:

$$(10{,}886 + 69{,}400 / \ddot{a}_{\overline{10}|.07}) \times 1.07 = (10{,}886 + 9{,}235) \times 1.07 = 21{,}529$$

Answer is C.

Question 20

The minimum required contribution of $100,000 was waived in 1999.

Amortization of waived deficiencies cannot be waived in future years. Therefore, in 2000, the waived amount is equal to the normal cost plus the amortization of the initial accrued liability:

$$\begin{aligned} \text{2000 waived amount} &= (100{,}000 + 600{,}000/\ddot{a}_{\overline{30}|.07}) \times 1.07 \\ &= (100{,}000 + 45{,}189) \times 1.07 \\ &= 155{,}352 \end{aligned}$$

The actual charges (as of the end of the year) to the funding standard account must be determined for 2000 and 2001 with regard to the waived deficiencies.

$$\text{2000 charge} = 100{,}000/a_{\overline{5}|.0943} = 25{,}997$$

The outstanding balance of the 1999 waived deficiency as of 1/1/2001 is:

$$(100{,}000 \times 1.0943) - 25{,}997 = 83{,}433$$

The 2001 charge due to waived deficiencies can be determined:

$$\text{2001 charge} = 83{,}433/a_{\overline{4}|.0847} + 155{,}352/a_{\overline{5}|.0847} = 25{,}454 + 39{,}392 = 64{,}846$$

The outstanding balance of the waived deficiencies as of 1/1/2002 is:

$$((83{,}433 + 155{,}352) \times 1.0847) - 64{,}846 = 194{,}164$$

A theoretical outstanding balance can be determined as of 1/1/2002 by accumulating the deficiencies and the end of year amortization charges using the plan funding rate of 7%.

$$(100{,}000 \times 1.07^2) + (155{,}352 \times 1.07) - (25{,}997 \times 1.07) - 64{,}846 = 188{,}054$$

The portion of the accumulated reconciliation account balance due to waived funding deficiencies is equal to the difference between the actual and theoretical outstanding balances:

$$194{,}164 - 188{,}054 = 6{,}110$$

Answer is C.

Question 21

The credit balance as of 12/31/2000 can be determined as the difference between the credits and charges for 2000 (increased with interest using the 2000 valuation rate of 8%):

$$\begin{aligned} CB_{12/31/2000} &= (150{,}000 \times 1.04) + (10{,}000 \times 1.08) \\ &\quad - [(90{,}000 + 39{,}000 + 11{,}000) \times 1.08] \\ &= 15{,}600 \end{aligned}$$

The outstanding balance of each of the bases in existence prior to 1/1/2001 must be determined so that they can be re-amortized using the new 7% interest rate. Note that the outstanding balance is determined using the old 8% interest rate.

$$\text{Outstanding balance of initial base} = 39{,}000\,\ddot{a}_{\overline{25}|.08} = 449{,}622$$

$$\text{Outstanding balance of amendment base} = 11{,}000\,\ddot{a}_{\overline{27}|.08} = 129{,}910$$

The old amortization bases must be re-amortized over their remaining periods using the new 7% interest rate. In addition, the new amortization base due to the assumption change must be amortized over 10 years. The minimum funding requirement as of 12/31/2001 is:

$$\begin{aligned} &(100{,}000 + 449{,}622/\ddot{a}_{\overline{25}|.07} + 129{,}910/\ddot{a}_{\overline{27}|.07} + 60{,}000/\ddot{a}_{\overline{10}|.07} - 15{,}600) \times 1.07 \\ &= (100{,}000 + 36{,}058 + 10{,}129 + 7{,}984 - 15{,}600) \times 1.07 \\ &= 148{,}271 \end{aligned}$$

Answer is B.

Question 22

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

The expected liability is equal to the accrued liability under the funding method if Smith and Jones had not retired. Under the unit credit method, this is just the present value of their accrued benefits, based upon their assumed retirement age of 65.

Smith has more than 25 years of service as of 1/1/2001, so Smith is fully accrued in his $30,000 projected benefit. Jones has 16 years of service as of 1/1/2002, and would have 19 years of service at age 65 if he continued to work. So, the accrued benefit for Jones as of 1/1/2001 is $25,263 ($30,000 × 16/19). The expected liability for the participants is:

Smith: $30,000 × $\ddot{a}_{65}^{(12)} \times v^3$ = $198,850

Jones: $25,263 × $\ddot{a}_{65}^{(12)} \times v^3$ = $167,452

Total = $198,850 + $167,452 = $366,302

The actual liability is equal to the present value of the early retirement benefits. Smith's age plus service exceeds 80, so Smith's accrued benefit is unreduced for early retirement. However, Jones' age plus service is only 78 (age 62 plus 16 years of service), so Jones' accrued benefit must be reduced to $21,474 ($25,263 × .85). The actual liability is:

Smith: $30,000 × $\ddot{a}_{62}^{(12)}$ = $265,200

Jones: $21,474 × $\ddot{a}_{62}^{(12)}$ = $189,830

Total = $265,200 + $189,830 = $455,030

The loss is equal to the difference between the actual and the expected liabilities:

Loss = $455,030 - $366,302 = $88,728

Answer is D.

Question 23

Note that the funding method is actually projected unit credit since there is a salary scale. The accrued liability is equal to the present value of the accrued benefit based upon projected salary.

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

The expected liability is equal to the accrued liability under the funding method if salary had increased by 4%, as expected. Under the unit credit method, this is just the present value of the accrued benefits, based upon a 4% salary increase in 2000. The expected liability is:

$$\text{Expected liability} = 2\% \times 52{,}000 \times \frac{1.04^9 + 1.04^{10} + 1.04^{11}}{3} \times 2 \text{ years} \times \ddot{a}_{65}^{(12)} \times v^{10}$$

$$= 14{,}470$$

The actual liability is equal to the present value of the accrued benefits based upon the actual salary increase. The actual liability is:

$$\text{Actual liability} = 2\% \times 56{,}000 \times \frac{1.04^8 + 1.04^9 + 1.04^{10}}{3} \times 2 \text{ years} \times \ddot{a}_{65}^{(12)} \times v^{10}$$
$$= 14{,}983$$

The loss is equal to the difference between the actual and the expected liabilities:

$$\text{Loss} = 14{,}983 - 14{,}470 = 513$$

Answer is B.

Question 24

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

Shortfall gains or losses are amortized in the funding standard account over 15 years (20 years for multiemployer plans), generally in the year beginning after the year that the bargaining agreement expires. However, if the bargaining agreement expires at the end of the year for which the shortfall gain or loss occurred, then the amortization of the shortfall gain or loss is deferred for at least one year. This is due to the fact that it is assumed that the bargaining agreement is renewed for the same period of years, and the amortization begins in the year following that renewed agreement would end (but not later than the 5th plan year after the gain or loss arose). (See IRS regulation 1.412(c)(1)-2(g)(2)(i).)

In this question, it is necessary to determine the funding standard account items for the 2001 plan year. However, any shortfall gain or loss from the year 2000 (the first year of the plan) need not be determined since that gain or loss would not begin to be amortized until 2002.

Similarly, the 2000 experience gain or loss determined under the entry age normal cost method is not to be amortized until 2002. (See IRS regulation 1.412(c)(1)-2(h)(2)(i).)

Therefore, the only funding standard account items in 2001 are the normal cost, and the amortization of the initial accrued liability. (Note that the credit balance is not used to determine the shortfall gain or loss.) The sum of the 2001 normal cost, plus amortization charges, as of 12/31/2001 is:

$$(36{,}000 + \frac{300{,}000}{\ddot{a}_{\overline{30}|}}) \times 1.07 = (36{,}000 + 22{,}594) \times 1.07 = 62{,}696$$

Since the actual base units for 2001 (10,000) is less than the estimated base units for 2001 (12,000), there is a shortfall loss. There was a shortfall of 2,000 base units. The shortfall loss for 2001 is:

$(2{,}000/12{,}000) \times 62{,}696 = 10{,}449$

Answer is B?

Unfortunately, the official answer key indicates that the correct answer range is choice E. It would appear that this result is obtained by including the amortization of the 2000 experience loss as part of the amortization charges for 2001.

The expected unfunded liability as of 1/1/2001 is:

$[(300{,}000 + 30{,}000) \times 1.07] - [((30{,}000 + 22{,}594) \times 1.07) + 3{,}600] = 293{,}224$

Note that the offsetting contribution is equal to the normal cost plus minimum amortization of the unfunded liability (as of the end of the year) plus the credit balance.

Since the actual unfunded liability as of 1/1/2001 is $315,000, there is an experience loss of $21,776.

Including the 5-year amortization of the loss as part of the amortization charges for 2001, the sum of the 2001 normal cost, plus amortization charges, as of 12/31/2001 is:

$$(36{,}000 + \frac{300{,}000}{\ddot{a}_{\overline{30}|}} + \frac{21{,}776}{\ddot{a}_{\overline{5}|}}) \times 1.07 = (36{,}000 + 22{,}594 + 4{,}964) \times 1.07 = 68{,}007$$

The shortfall loss for 2001 is:

$(2{,}000/12{,}000) \times 68{,}007 = 11{,}335$

This answer falls in the answer range E. It is my assumption that the reasoning for this second solution rests with IRS regulation 1.412(c)(1)-2(d). That regulation section seems to indicate that the amount to be amortized as part of the current year's amortization charges includes the experience gain or loss, as section (d)(2) of that regulation specifically indicates that the shortfall gain or loss is only amortized when applicable. There is no specific mention there of the experience gain or loss, and the special amortization rules associated with the experience gain or loss are only discussed in regulation 1.412(c)(1)-2(h).

However, the intent of the shortfall gain or loss is to amortize the funding standard account amounts that are pro-rated out of the current year's charges (less credits). Since the experience gain or loss is clearly NOT to be amortized immediately, it only makes sense to exclude them from the determination of the shortfall gain or loss until such year as they begin to be amortized. Upon further reflection, the Joint Board has changed the grading of this question to reflect choice B as the correct answer.

Question 25

Cash balance plans are defined benefit plans in which the participant receives the greater of the present value of the accrued benefit based upon the benefit formula, or the accumulated cash balance account. In this question, it is given that the termination benefit is the cash balance account.

Withdrawal is only assumed during the first 3 years of employment. Since withdrawals are assumed to occur on the first day of the year, clearly there is no termination benefit if Smith withdraws in 2001 since there is no cash balance account at that time, as the first credit into the account is made at the end of the year. So, termination benefits will only be provided if Smith terminates at age 31 or at age 32. The cash balance account must be determined at each of those ages.

The cash balance account as of 12/31/2001 is equal to 4% of Smith's 2001 compensation:

$$\text{Account}_{12/31/2001} = 4\% \times 30{,}000 = 1{,}200$$

If Smith is still employed in 2002, the cash balance account as of 12/31/2002 is equal to 4% of Smith's 2002 compensation (2001 compensation increased by 3%), plus the cash balance account value as of 12/31/2001 increased with interest at 6% (the applicable 30-year Treasury rate which is given as the interest rate credit for the cash balance account):

$$\text{Account}_{12/31/2002} = (4\% \times 30{,}000 \times 1.03) + (1{,}200 \times 1.06) = 2{,}508$$

The present value of the withdrawal benefit is equal to the present value of the actual benefits to be paid upon termination, each multiplied by the probability of termination. Note that the termination benefit is paid on the date of termination (first day of the year).

$$\begin{aligned} \text{PV}_{1/1/2001} &= (1{,}200 \times p_{30}^{(w)} \times q_{31}^{(w)})v + (2{,}508 \times p_{30}^{(w)} \times p_{31}^{(w)} \times q_{32}^{(w)})v^2 \\ &= (1{,}200 \times .7 \times .2)v + (2{,}508 \times .7 \times .8 \times .1)v^2 \\ &= 280 \end{aligned}$$

Answer is A.

Question 26

The minimum required contribution for 2000 (without regard to the credit balance) is:

$$(310{,}000 + 60{,}000) \times 1.07 = 395{,}900$$

90% of the minimum required contribution (as of 1/1) for 2001 (without regard to the credit balance) is:

$$(350{,}000 + 45{,}000) \times .9 = 355{,}500$$

The quarterly contribution requirement is 25% of the smaller of the two above numbers, which is:

$$25\% \times 355{,}500 = 88{,}875$$

The quarterly contribution due dates are 4/15/2001, 7/15/2001, 10/15/2001, and 1/15/2002. Although no contributions were made until 2/15/2002, the credit balance can be used to pay for part of the quarterly contribution requirement. The credit balance must be increased with valuation interest to 4/15/2001, the first quarterly due date.

$$50{,}000 \times 1.07^{3.5/12} = 50{,}996$$

The required quarterly contribution on 4/15/2001 can be reduced by the accumulated credit balance:

$$88{,}875 - 50{,}996 = 37{,}879$$

The remaining contribution due 4/15/2001, as well as the other required quarterly contributions, is late. Interest must be charged based upon 175% of the Federal mid-term rate through 2/15/2002, offset by interest at the valuation rate through 12/31/2001.

$$37{,}879 \times (1.0991^{10/12} - 1.07^{8.5/12}) = 1{,}244$$
$$88{,}875 \times (1.0991^{7/12} - 1.07^{5.5/12}) = 2{,}237$$
$$88{,}875 \times (1.0991^{4/12} - 1.07^{2.5/12}) = 1{,}582$$
$$88{,}875 \times (1.0991^{1/12} - 1) = 703$$
$$\text{Total} = 1{,}244 + 2{,}237 + 1{,}582 + 703 = 5{,}766$$

Answer is B.

Question 27

The minimum required contribution for 2000 (without regard to the credit balance) is:

$$(100{,}000 + 25{,}000) \times 1.07 = 133{,}750$$

90% of the minimum required contribution (as of 1/1) for 2001 (without regard to the credit balance) is:

$$(120{,}000 + 25{,}000) \times .9 = 130{,}500$$

The quarterly contribution requirement is 25% of the smaller of the two above numbers, which is:

$$25\% \times 130{,}500 = 32{,}625$$

The credit balance as of 12/31/1999 can be determined using the balance equation.

Unfunded balance = Outstanding balance – Credit balance
- Reconciliation account balance

800,000 – 600,000 = 205,000 – Credit balance
Credit balance = 5,000

The credit balance as of 12/31/2000 can be determined as the difference between the credits and charges for 2000 (increased with interest using the 2000 valuation rate of 7%):

$$CB_{12/31/2000} = (125{,}000 \times [1 + (.07)(8.5/12)]) + (5{,}000 \times 1.07) - [(100{,}000 + 25{,}000) \times 1.07]$$
$$= 2{,}798$$

The credit balance can be used to pay for part of the quarterly contribution requirement. The credit balance must be increased with valuation interest to 4/15/2001, the first quarterly due date.

$$2{,}798 \times 1.07^{3.5/12} = 2{,}854$$

The quarterly contribution due on 4/15/2001 is:

$$32{,}625 - 2{,}854 = 29{,}771$$

Answer is B.

Question 28

Final average compensation is based upon the 3-year average in 2008, 2009, and 2010 (since the assumed retirement date is 1/1/2011). Projecting salary using the 4% salary scale to those years will exceed the IRC section 410(a)(17) maximum of $170,000. Therefore, final average salary for the participant is $170,000.

Since there is a salary scale, the unit credit method being used here is actually projected unit credit. Under the projected unit credit method, the normal cost is equal to the present value of the benefit accrual for the year (based upon projected final average salary). This is:

$$\text{Normal cost} = 5\% \times 170{,}000 \times \ddot{a}_{65}^{(12)} \times v^{10} = 39{,}926$$

Since there are 5 years of past service, the accrued liability is equal to:

$$\text{Accrued liability} = 5\% \times 170{,}000 \times 5 \text{ years} \times \ddot{a}_{65}^{(12)} \times v^{10} = 199{,}629$$

The initial unfunded accrued liability under the method change is:

$$\begin{aligned}\text{Unfunded accrued liability} &= \text{Accrued liability} - \text{Actuarial assets} \\ &= 199{,}629 - 135{,}000 \\ &= 64{,}629\end{aligned}$$

Under the rules of Revenue Procedure 2000-40, the unfunded accrued liability is to be amortized over 10 years for minimum funding purposes. The minimum funding requirement as of 1/1/2001 is:

$$39{,}926 + 64{,}629/\ddot{a}_{\overline{10}|} = 39{,}926 + 8{,}600 = 48{,}526$$

Answer is C.

Note that the IRC section 415 limitation must also be checked in this question. However, it is clear that since 1/10 of the dollar limitation is $14,000, the annual accrual under the benefit formula of $8,500 is well under the IRC section 415 limitation.

Question 29

Note that for multiemployer plans, experience gains and losses are amortized over 15 years, and changes in the accrued liability due to assumption changes are amortized over 30 years. The outstanding balance of the amortization bases as of 1/1/2001 is:

$$\begin{aligned}\text{Outstanding balance} &= 90{,}000\,\ddot{a}_{\overline{25}|} + 30{,}000\,\ddot{a}_{\overline{26}|} + 50{,}000\,\ddot{a}_{\overline{27}|} \\ &\quad + 40{,}000\,\ddot{a}_{\overline{14}|} - 20{,}000 \\ &= 1{,}122{,}240 + 379{,}607 + 641{,}289 + 374{,}306 - 20{,}000 \\ &= 2{,}497{,}442\end{aligned}$$

The accrued liability as of 1/1/2001 can be determined using the balance equation.

$$\begin{aligned}\text{Unfunded balance} &= \text{Outstanding balance} - \text{Credit balance} \\ &\quad - \text{Reconciliation account balance} \\ \text{Accrued liability} - \text{Actuarial assets} &= 2{,}497{,}442 - 55{,}000 \\ \text{Accrued liability} - 700{,}000 &= 2{,}497{,}442 - 55{,}000 \\ \text{Accrued liability} &= 3{,}142{,}442\end{aligned}$$

Answer is C.

Question 30

The unfunded current liability for the additional funding charge is:

$$\begin{aligned}\text{UCL} &= \text{Current liability} - (\text{Actuarial assets} - \text{Credit balance}) \\ &= 3{,}000{,}000 - (1{,}475{,}000 - 0) = 1{,}525{,}000\end{aligned}$$

Note that the funding deficiency is NOT treated as a negative credit balance.

The funded current liability percentage is:

$$\text{Funded CL\%} = 1{,}475{,}000/3{,}000{,}000 = 49.1667\%$$

The unfunded new liability can be determined using the formula for the unfunded new liability amount.

$$\begin{aligned}\text{Unfunded new liability amount} &= \text{Unfunded new liability} \\ &\quad \times [.3 - .4(\max\{49.1667\% - 60\%;0\}] \\ 150{,}000 &= \text{Unfunded new liability} \times .3 \\ \text{Unfunded new liability} &= 500{,}000\end{aligned}$$

The unfunded old liability is equal to the unfunded current liability less the unfunded new liability:

$$\text{Unfunded old liability} = 1{,}525{,}000 - 500{,}000 - 325{,}000 = 700{,}000$$

The unfunded old liability is amortized over 6 years in 2001:

$$\text{Unfunded old liability amount} = 700{,}000 / \ddot{a}_{\overline{6}|.061} = 134{,}591$$

The deficit reduction contribution is:

$$\begin{aligned}\text{DRC} &= \text{Unfunded old liability amount} + \text{unfunded new liability amount} \\ &\quad + \text{expected increase in current liability} \\ &= 134{,}591 + 150{,}000 + 75{,}000 \\ &= 359{,}591\end{aligned}$$

The unpredictable contingent event amount is the largest of:

(1) The 7-year amortization of the unpredictable contingent events liability
$= 325{,}000 / \ddot{a}_{\overline{7}|.061} = 55{,}067$

(2) The product of the unpredictable contingent events liability and the factor used to amortize the new unfunded liability
$= 325{,}000 \times .3 = 97{,}500$

(3) The product of the unpredictable events benefits paid in 2001 and 100% reduced by the funded current liability percentage
$= 65{,}000 \times (100\% - 49.1667\%) = 33{,}042$

The largest of these is 97,500.

The sum of the deficit reduction contribution and the unpredictable contingent event amount is:

$$359{,}591 + 97{,}500 = 457{,}091$$

Answer is D.

Question 31

Under the individual level premium funding method, the initial normal cost is spread from the age at the time of plan participation, and additional increments of normal cost are determined due to benefit formula increases/decreases (and compensation increases/decreases) from the date that the increase/decrease took effect.

The normal cost under the original formula is:

$$NC_{original} = \$20 \times 40 \text{ years} \times 12\,\ddot{a}_{65}^{(12)} \div \ddot{s}_{\overline{31}|} = 868$$

The normal cost increase under the 1/1/2001 plan amendment is:

$$NC_{increase} = \$5 \times 40 \text{ years} \times 12\,\ddot{a}_{65}^{(12)} \div \ddot{s}_{\overline{25}|} = 350$$

The total normal cost as of 1/1/2001 is:

$$NC = 868 + 350 = 1{,}218$$

Answer is C.

Question 32

Under the attained age normal method, the initial unfunded liability is equal to the accrued liability under the unit credit method. This is the present value of the accrued benefit.

$$\text{Initial unfunded liability} = \$40 \times 11 \text{ years} \times 12\,\ddot{a}_{65}^{(12)} \times v^{19} = 12{,}760$$

The present value of future benefits as of 1/1/2000 is:

$$PVFB_{1/1/2000} = \$40 \times 30 \text{ years} \times 12\,\ddot{a}_{65}^{(12)} \times v^{19} = 34{,}800$$

The normal cost (as of 1/1/2001) is equal to:

$$NC = \frac{\text{PVFB - Actuarial assets - Unfunded balance}}{\text{Temporary annuity}}$$

$$= \frac{34{,}800 - 0 - 12{,}760}{\ddot{a}_{\overline{19}|}}$$

$$= 1{,}993$$

The minimum funding requirement for 2000 is:

$$\text{Minimum}_{12/31/2000} = (1{,}993 + 12{,}760/\ddot{a}_{\overline{30}|}) \times 1.07 = (1{,}993 + 961) \times 1.07 = 3{,}161$$

The assets (gain)/loss for 2000 is equal to the difference between the actual assets and the expected assets. Note that the actual contribution was paid on 1/1/2000 in an amount equal to the minimum funding requirement as of 1/1/2000. So the expected assets would be 3,161, the minimum funding requirement as of the end of the year.

There is a loss since the actual assets is less than the expected assets.

$$2000 \text{ Loss} = 3{,}161 - 2{,}700 = 461$$

Since there were no other gains or losses, the normal cost as of 1/1/2001 should equal the normal cost from 1/1/2000, adjusted for the amortization of the 2000 asset loss.

$$NC_{1/1/2001} = 1{,}993 + 461/\ddot{a}_{\overline{18}|} = 1{,}993 + 43 = 2{,}036$$

Answer is B.

Question 33

Plan A has excess assets at the time of the spinoff. IRC section 414(l)(2) provides that the excess assets must be allocated to plans B and C in proportion to the excess of their full funding limitation liabilities over their present value of accrued benefits. In addition, each plan receives an asset allocation equal to their present value of accrued benefits. The credit balance is also allocated in proportion to the excess of their full funding limitation liabilities over their present value of accrued benefits.

The assets and credit balance are allocated to Plans B and C as follows:

	Plan A	Plan B	Plan C
(1) Present value of accrued benefits	$350,000	$225,000	$125,000
(2) FFL liability	500,000	350,000	150,000
(3) Difference of (2) – (1)	150,000	125,000	25,000
(4) Excess assets	90,000	75,000	15,000
(5) Actuarial assets (1) + (4)	440,000	300,000	140,000
(6) Credit balance	80,000	66,667	13,333

The difference between the assets and credit balance allocated to Plan C is:

$$140{,}000 - 13{,}333 = 126{,}667$$

Answer is C.

Question 34

The outstanding balance of the initial unfunded liability as of 1/1/2001 is:

$$110{,}000 \times \frac{\ddot{a}_{\overline{22}|.07}}{\ddot{a}_{\overline{30}|.07}} = 98{,}052$$

The new amortization base due to the change in actuarial assumptions is:

$$180{,}000 - 202{,}000 = (22{,}000)$$

The new amortization base due to the plan amendment is:

$$248{,}000 - 180{,}000 = 68{,}000$$

The net amortization charge as of 1/1/2001 is:

$$98{,}052/\ddot{a}_{\overline{22}|.08} - 22{,}000/\ddot{a}_{\overline{10}|.08} + 68{,}000/\ddot{a}_{\overline{30}|.08} = 8{,}900 - 3{,}036 + 5{,}593 = 11{,}457$$

Answer is B.

Question 35

The expected unfunded liability as of 1/1/2001 is:

$$\text{Expected unfunded}_{1/1/2001} = ((95{,}000 - 20{,}000) + 9{,}000) \times 1.07 - 12{,}000 = 77{,}880$$

The actual unfunded liability as of 1/1/2001 is:

$$\text{Actual unfunded}_{1/1/2001} = 530{,}000 - 420{,}000 = 110{,}000$$

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

$$\text{2001 Loss} = 110{,}000 - 77{,}880 = 32{,}120$$

The credit balance in the funding standard account as of 12/31/2000 is:

$$CB_{12/31/2000} = (20{,}000 \times 1.07) + 12{,}000 - [(9{,}000 + 8{,}000) \times 1.07] = 15{,}210$$

The minimum required contribution as of 12/31/2001 is:

$$\begin{aligned}\text{Minimum}_{12/31/2001} &= (10{,}500 + 8{,}000 + 32{,}120/\ddot{a}_{\overline{5}|} - 15{,}210) \times 1.07 \\ &= (10{,}500 + 8{,}000 + 7{,}321 - 15{,}210) \times 1.07 \\ &= 11{,}354\end{aligned}$$

Answer is C.

Question 36

The outstanding balance of each of the bases as of 1/1/2000 is:

$$185{,}000 \times \frac{\ddot{a}_{\overline{28}|.08}}{\ddot{a}_{\overline{30}|.08}} = 181{,}603$$

$$20{,}000 \times \frac{\ddot{a}_{\overline{29}|.08}}{\ddot{a}_{\overline{30}|.08}} = 19{,}823$$

In addition, there is a (10,000) gain base, and a base due to the increase in liability due to the assumption change on 1/1/2000 of 15,000.

Each base must be re-amortized using the new 7% interest rate for 2000. The net amortization charge as of 1/1/2000 is:

$$\begin{aligned}&181{,}603/\ddot{a}_{\overline{28}|.07} + 19{,}823/\ddot{a}_{\overline{29}|.07} - 10{,}000/\ddot{a}_{\overline{5}|.07} + 15{,}000/\ddot{a}_{\overline{10}|.07} \\ &= 13{,}984 + 1{,}509 - 2{,}279 + 1{,}996 = 15{,}210\end{aligned}$$

The outstanding balance of the bases on 12/31/2000 (including the 8,000 gain during 2000) is:

$$[(181{,}603 + 19{,}823 - 10{,}000 + 15{,}000) - 15{,}210] \times 1.07 - 8{,}000 = 196{,}601$$

Using the balance equation,

Unfunded balance = Outstanding balance – Credit balance
- Reconciliation account balance

375,000 – 200,000 = 196,601 – Credit balance
Credit balance = 21,601

Answer is C.

Question 37

Under the unit credit method, the normal cost is the present value of the benefit accrual for the year. The normal cost must be determined under each set of retirement assumptions. Note that for retirement age 62, the early retirement reduction must be applied to the accrual.

$$\text{Old } NC_{1/1/2001} = 75 \times 12\,\ddot{a}_{65}^{(12)} \times v^4 = 6{,}935$$

$$\text{New } NC_{1/1/2001} = 75 \times (27/30) \times 12\,\ddot{a}_{62}^{(12)} \times v = 8{,}130$$

$$\text{Increase NC} = 8{,}130 - 6{,}935 = 1{,}195$$

Under the unit credit method, the accrued liability is the present value of the benefit accrued from prior years. The accrued liability must be determined under each set of retirement assumptions.

$$\text{Old } AL_{1/1/2001} = 75 \times 10 \text{ years} \times 12\,\ddot{a}_{65}^{(12)} \times v^4 = 69{,}347$$

$$\text{New } AL_{1/1/2001} = 75 \times 10 \text{ years} \times (27/30) \times 12\,\ddot{a}_{62}^{(12)} \times v = 81{,}303$$

$$\text{Increase AL} = 81{,}303 - 69{,}347 = 11{,}956$$

The increase in the accrued liability due to the assumption change must be amortized over 10 years.

The increase in the minimum required contribution for 2001 is:

$$(1{,}195 + 11{,}956/\ddot{a}_{\overline{10}|}) \times 1.07 = (1{,}195 + 1{,}591) \times 1.07 = 2{,}981$$

Answer is C.

Question 38

Statement I is a false statement. Automatic approval granted by Revenue Procedure 2000-40 cannot be used, but an application requesting approval of a change in funding method may be submitted by following the rules of Revenue Procedure 2000-41.

Statement II is a true statement. See IRS regulation 1.412(c)(2)-1(b)(6).

Statement III is a true statement. See Revenue Procedure 2000-40, section 5.01(3).

Answer is C.

Question 39

The deduction for contributions to a profit sharing plan are limited by IRC section 404(a)(3) to 15% of total compensation for the participants in the profit sharing plan. The total compensation for participants in the profit sharing plan includes those who are only in the profit sharing plan and those who are in both the profit sharing and defined benefit plans. The 404(a)(3) limit is:

$$(560{,}000 + 1{,}500{,}000) \times 15\% = 309{,}000$$

Since there are both a defined benefit and a defined contribution plan (with at least one participant in common), the deduction for the two plans combined is limited by IRC section 404(a)(7). This limit is the greater of:

(1) 25% of the total compensation for the participants in either plan, or
(2) The defined benefit minimum funding requirement (or the unfunded current liability under RPA'94, if greater, for plans with more than 100 participants)

25% of total compensation is:

$$(200{,}000 + 560{,}000 + 1{,}500{,}000) \times 25\% = 565{,}000$$

It is not clear what the minimum funding requirement for the defined benefit plan is, since there is not enough information to determine this. But given the fact that the normal cost is only 50,000, and the unfunded accrued liability is 150,000 (900,000 – 750,000), it would appear that 25% of compensation is greater than the minimum funding requirement for the defined benefit plan.

The full funding limitation must be determined for the defined benefit plan, since that is the contribution made. The full funding limitations are:

ERISA: $(900{,}000 + 50{,}000 - 750{,}000) \times 1.07 = 214{,}000$
OBRA '87: $(1{,}000{,}000 \times 160\%) - (750{,}000 \times 1.07) = 797{,}500$
RPA '94: $(1{,}250{,}000 \times 90\%) - (750{,}000 \times 1.07) = 322{,}500$

The overall full funding limitation is equal to the lesser of the ERISA or the OBRA '87 limitations, but not less than the RPA '94 limitation. That means that the full funding limitation is 322,500.

It is necessary to make sure that this is deductible. The limit adjustment is determined using a fresh start. That means it is equal to the 10-year amortization of the unfunded liability. This is:

$$(900{,}000 - 750{,}000)/\ddot{a}_{\overline{10}|} = 19{,}959$$

The normal cost plus the limit adjustment (as of the end of the year) is:

$$(50{,}000 + 19{,}959) \times 1.07 = 74{,}856$$

This is less than the 322,500. However, since the defined benefit plan has more than 100 participants, the unfunded current liability can be deducted. This is:

$$1{,}250{,}000 - (750{,}000 \times 1.07) = 447{,}500$$

Therefore, the 322,500 contribution to the defined benefit plan could be deducted under IRC section 404(a)(1).

The maximum deduction that can be taken for the profit sharing plan under IRC section 404(a)(7) is:

$$565{,}000 - 322{,}500 = 242{,}500$$

This is also deductible under IRC section 404(a)(3).

Answer is C.

Question 40

The minimum funding requirement for 2001 (without regard to the full funding limitation) is equal to the normal cost with interest to the end of the plan year:

$$90{,}000 \times 1.07 = 96{,}300$$

The full funding limitations are:

ERISA: $(1{,}070{,}000 + 90{,}000 - 1{,}100{,}000) \times 1.07 = 64{,}200$

OBRA '87: $((1{,}200{,}000 + 130{,}000) \times 160\% \times 1.06) - (1{,}100{,}000 \times 1.07)$
$= 1{,}078{,}680$

RPA '94: $((1{,}200{,}000 + 130{,}000) \times 90\% \times 1.06) - (1{,}100{,}000 \times 1.07) = 91{,}820$

The overall full funding limitation is equal to the lesser of the ERISA or the OBRA '87 limitations, but not less than the RPA '94 limitation. That means that the full funding limitation is 91,820.

The minimum funding requirement for 2001 is, therefore, 91,820.

Answer is D.

Question 41

In the determination of the full funding limitation for IRC section 404 purposes, any contribution carryover (or other undeducted contribution) must be subtracted from the assets at the END of the fiscal year. It is important not to do this subtraction at the beginning of the year, since the undeducted contribution would then be credited with interest to the end of the year. This is an important difference between the full funding limitation for IRC section 404 versus IRC section 412.

The full funding limitations are:

ERISA: $(95{,}000 + 8{,}000) \times 1.07 - (97{,}000 \times 1.07 - 200) = 6{,}620$

OBRA '87: $((57{,}000 + 9{,}000) \times 160\% \times 1.061) - (97{,}000 \times 1.07 - 200) = 8{,}452$

RPA '94: $((57{,}000 + 9{,}000) \times 90\% \times 1.061) - (101{,}000 \times 1.07 - 200) = 0$

The overall full funding limitation is equal to the lesser of the ERISA or the OBRA '87 limitations, but not less than the RPA '94 limitation. That means that the full funding limitation is 6,620.

Answer is E.

Question 42

Under the unit credit method, the accrued liability is the present value of the benefit accrued from prior years. The normal cost is the present value of the benefit accrual for the current year. In this situation, the participant has 10 years of past service. Therefore, the present value of a single year's accrual is equal to one-tenth of the accrued liability:

$$50{,}000 \times 1/10 = 5{,}000$$

Since the accrual in the current year is at the \$65 level rather than the \$50 level, the normal cost for 2000 is just equal to 5,000 pro-rated upward to reflect the higher accrual.

$$NC_{1/1/2000} = 5{,}000 \times (65/50) = 6{,}500$$

The minimum funding requirement for 2000 as of 12/31/2000 was:

$$(6{,}500 + 50{,}000/\ddot{a}_{\overline{30}|}) \times 1.07 = (6{,}500 + 3{,}766) \times 1.07 = 10{,}985$$

The deductible limit for 2000 was:

$$(6{,}500 + 50{,}000/\ddot{a}_{\overline{10}|}) \times 1.07 = (6{,}500 + 6{,}653) \times 1.07 = 14{,}074$$

The credit balance in the funding standard account as of 12/31/2000 is:

$$[14{,}074 \times (1 + i(.07)] - 10{,}985 = 3{,}828$$

The normal cost for 2001 would just be equal to the normal cost for 2000 increased with one year's interest credit at the valuation rate, to reflect the participant being one year closer to retirement.

$$NC_{1/1/2001} = 6{,}500 \times 1.07 = 6{,}955$$

The minimum funding requirement for 2001 as of 1/1/2001 is:

$$6{,}955 + 50{,}000/\ddot{a}_{\overline{30}|} - 3{,}828 = 6{,}893$$

Answer is D.

Question 43

The new amortization base resulting from the method change is equal to the difference between the actuarial value of assets before the method change and the actuarial value of assets after the method change. Since the value of assets increased, there is a gain due to the method change.

Gain due to method change = 610,000 – 620,000 = (10,000)

The new amortization base resulting from the plan amendment is equal to the difference between the accrued liability after the plan amendment and the accrued liability before the plan amendment. Since the accrued liability increased, there is a loss due to the plan amendment.

Loss due to plan amendment = 720,000 – 700,000 = 20,000

The normal cost does not change due to the asset valuation method change since the increase in the actuarial value of the assets is offset by the unfunded balance of the method change amortization base. However, the amendment increases the present value of future benefits by $35,000, and increases the unfunded balance of the amortization bases by only $20,000. The difference will increase the normal cost for 2001. The increase in the normal cost is:

(35,000 – 20,000)/(33,200,000/4,000,000) = 1,807

The increase in the minimum required contribution for 2001 payable 12/31/2001 is:

$$(1{,}807 + 20{,}000/\ddot{a}_{\overline{30}|} - 10{,}000/\ddot{a}_{\overline{10}|}) \times 1.07 = (1{,}807 + 1{,}506 - 1{,}331) \times 1.07$$
$$= 2{,}121$$

Answer is B.