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FALL 2005 EA-2A EXAM SOLUTIONS

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Fall 2005 EA-2A Exam Solutions

These solutions use beginning of year amortization payments in setting up the Minimum Funding Standard Account. These solutions were prepared based on the law as in effect at June 30, 2005.

These solutions have been compared with those produced by other technical actuaries, and they represent my best understanding of the correct way to solve these problems. As usual, it seems easy to get an answer in the correct range as long as you are not actually taking the exam!

For problems involving the deductible limit you should use the following sequence of steps:

1. Calculate the normal cost plus limit adjustments with interest to the earlier of the end of the plan year or the end of the tax year.
2. Calculate the Full Funding Limitation under Section 404 with interest to the end of the plan year. If this is less than the result of step one, then you can skip to step four.
3. Calculate the absolute minimum amount necessary to produce a non-negative credit balance in the Minimum Funding Standard Account. This amount should never be based on the Alternative MFSA. This amount may be increased by the amount of any "includible employer contribution."
4. The maximum deductible limit is the greater of (1) and (3), but not greater than (2).
5. If the Unfunded Current Liability exceeds the final deductible limit, then the final deductible limit will be the UCL. This UCL limit ignores recent benefit improvements for small plans with highly compensated employees.

Revision History:

August 11, 2014	Corrected solution for problem 12
September 8, 2007	Corrected solution for problem 25 (page 3)
October 3, 2006	Corrected solution for problem 23
August 14, 2006	Original solutions

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NOTES on 2005 exam

The 2005 exam was similar to the 2003 exam, and harder than some earlier exams. This means that you had to get a lower number of points correct to pass in 2005 than in 2004:

Exam <u>Year</u>	Pass <u>Mark</u>	Percentage <u>Who passed</u>
2005	99	43.0
2004	104	44.6
2003	102	41.4
2002	112	44.1

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Problem 1

Similar to 2004 #29

FALSE

This tests a small detail in RP 2000-40. In Section 3.01(1), it specifically excludes a cash balance plan from getting automatic approval to change to the Unit Credit method.

Answer is B

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Problem 2

Similar to 2004 #29

TRUE

The key point of this problem is that this is a collectively bargained plan. RPA '94 added §412(c)(12) to the Internal Revenue Code, which states “In determining projected benefits, the funding method ... shall anticipate benefit increases ...” This requires that, for collectively bargained plans, the minimum funding requirement is determined based on the ultimate level of benefits.

Answer is A

NOTE:

There is NO requirement that the current liability reflect any benefit increases that become effective beyond the end of the current plan year.

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Problem 3 – Page 1

Similar to 2003 #41

With an individual cost method, there are two things to be aware of. One is that you should check the Full Funding Limitation (FFL) if you have sufficient information. The other is that you should check for experience gains or losses each year.

In this problem, you have no asset information, so you can't calculate the \$412 Full Funding Limitation. You are also told that there was no G/L during 2004.

The first thing you should do is to calculate the 01/01/2005 valuation results using the old plan formula. Then you can calculate the new plan results by a pro-rata adjustment based on the new plan benefit.

Under the Unit Credit cost method, the normal cost grows with interest and survivorship. Since there is no G/L for 2004, and all participants are under age 46, both the normal cost and accrued liability at 01/01/2005 are equal to the expected values:

OLD PLAN - \$30 benefit

$$01/01/05 AL_1 = {}_eAL_1$$

$$01/01/05 NC_1 = {}_eNC_1$$

$$\begin{aligned} {}_eAL_1 &= (1+i) * (NC_0 + AL_0) - (\text{benefit payments} + \text{interest}) \\ &= 1.07 * (315,000 + 4,000,000) - 0 \\ &= 4,617,050 \end{aligned}$$

$$\begin{aligned} {}_eNC_1 &= (1+i) * (NC_0) \\ &= 1.07 * (315,000) \\ &= 337,050 \end{aligned}$$

Description	Old Plan - \$30	New Plan - \$35
Accrued liability	4,617,050	5,386,558 = (35/30) * 4,617,050
Normal cost	337,050	393,225 = (35/30) * 337,050

$$\text{Plan change} = 5,386,558 - 4,617,050 = 769,508$$

$$\text{Plan amort} = 57,955 = 769,508 \div \ddot{a}_{30|.07}$$

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Problem 3 – Page 2

2005 Minimum Funding Standard Account			
Charges		Credits	
Normal Cost	393,225	Credit Balance	0
NET amortization	100,000	12/31/05 minimum	x
PLAN amortization	57,955		
7% interest	38,583	7% interest	0
Total charges	589,763	Total credits	x

The 12/31/05 minimum contribution is 589,763.

Answer is C

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Problem 4 – Page 1

Similar to 2004 #8

The key to this problem is carefully handling the change in actuarial assumptions. You must calculate the 412 amortizations under the old and new assumptions.

This is a very long calculation problem. You must determine the Unit Credit accrued liability at 01/01/04, and use that value for the initial accrued liability. At 01/01/05, you have to allow for the decrease in the interest rate from 7% to 6%.

01/01/2004 Valuation - 7% interest

Description

Birth Date	01/01/54
01/2004 Age	50

Hire Date	01/01/74
Past service	30
Future service	15

Accrued benefit	$12(40)(30)$ $= 14,400$
-----------------	----------------------------

PV accrued benefit	$14,400(D_{65} / D_{50}) \ddot{a}_{65}^{(12)}$
UC accrued liability	$14,400(1.07)^{-15} (9.87)$
IAL	$= 51,514$

UC normal cost	$12(40)(1.07)^{-15} (9.87)$ $= 51,514 / 30$ $= 1,717$
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01/01/2005 Valuation - 6% interest

Description

Birth Date	01/01/54
01/2005 Age	51

Hire Date	01/01/74
Past service	31
Future service	16

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Problem 4 – Page 2

01/01/2005 Valuation - 6% interest (continued)

$$\begin{aligned}\text{Accrued benefit} & 12(40)(31) \\ & = 14,880\end{aligned}$$

$$\begin{aligned}\text{PV accrued benefit} & 14,880(D_{65} / D_{51}) \ddot{a}_{65}^{(12)} \\ \text{UC accrued liability} & 14,880(1.06)^{-14} (10.65) \\ \text{IAL} & = 70,092\end{aligned}$$

$$\begin{aligned}\text{UC normal cost} & 12(40)(1.06)^{-14} (10.65) \\ & = 70,092 / 31 \\ & = 2,261\end{aligned}$$

For the Minimum Funding Standard Account (MFSA), you have two amortization bases. The remaining balance of the IAL should be amortized at 6% for the remaining period of 29 years. You need to determine the change in the accrued liability, and set up an assumption change base, which will be amortized over 10 years.

$$\begin{aligned}7\% \text{ IAL amort} & = 51,514 / \ddot{a}_{30|.07} \\ \text{O/S } 7\% \text{ base} & = 51,514 (\ddot{a}_{29|.07} / \ddot{a}_{30|.07}) \\ & = 50,968\end{aligned}$$

$$\begin{aligned}6\% \text{ IAL amort} & = 50,968 / \ddot{a}_{29|.06} \\ & = 3,538\end{aligned}$$

$$\begin{aligned}\text{Old } 7\% \text{ AL} & = 14,880(1.07)^{-14} (9.87) \\ & = 56,957\end{aligned}$$

$$\begin{aligned}\text{Change in AL} & = 70,092 - 56,957 \\ & = 13,135\end{aligned}$$

$$\begin{aligned}6\% \text{ assm amort} & = 13,135 / \ddot{a}_{10|.06} \\ & = 1,684\end{aligned}$$

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Problem 4 – Page 3

2005 Minimum Funding Standard Account			
Charges		Credits	
Normal Cost	2,261	Credit Balance	0
IAL amortization	3,538		
ASSM amortization	1,684	12/31 contribution	x
6% interest	449	6% interest	0
Total charges	7,932	Total credits	x

You have no asset information to calculate the §412 Full Funding Limitation. The problem asks for the minimum contribution at 12/31/05. That contribution is 7,932.

Answer is B

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Problem 5 – Page 1

Similar to 2003 #10

The key to this problem is calculating the Full Funding Limitation (FFL) credit in the 2005 Minimum Funding Standard Account (MFSA). The problem has been simplified a bit, since you are given a net amortization amount for the MFSA:

2005 Minimum Funding Standard Account			
Charges		Credits	
Normal Cost	60,000	Credit Balance	0
Net amortization	1,500	01/01/05 contribution	50,000
		03/15/06 contribution	1,000
		09/15/06 contribution	x
7% interest	4,305	7% interest	3,500
Total charges	65,805	Total credits	x+54,500

This seems to imply that the minimum contribution is 65,805 - 54,500, or 11,305, but that is incorrect. You should check the Full Funding Limitation for purposes of 412.

Based on the 12/82 proposed regulation, the Accumulated Funding Deficiency (AFD) based on no contribution and no credit balance must be calculated. If the AFD exceeds the Full Funding Limitation, then there will be a Full Funding Credit in the MFSA for 2005. The AFD equals the total MFSA charges less the amortization credits with interest, or 65,805.

The final Full Funding Limitation is the greater of the ERISA and RPA FFL values. If the Accumulated Funding Deficiency exceeds the Full Funding Limitation, then there is a credit in the MFSA equal to the excess.

The ERISA Full Funding Limitation is defined as:

$$\begin{aligned}\text{\$412 "ERISA" FFL} &= (1+i) * (\text{UC NC} + \text{UC AL}) - (1+i) * [\text{lesser (MVA, AAV)} - \text{CB}] \\ &= 1.07 * (60,000 + 500,000) - 1.07 * (515,000 - 0) \\ &= 48,150\end{aligned}$$

The RPA Full Funding Limitation is defined as NOTE - this uses 12/31 CL

$$\begin{aligned}\text{\$412 RPA FFL floor} &= 90\% (12/31 \text{ RPA CL}) - [1.07(\text{AAV})] && \text{(if no ben pmts)} \\ 90\% \text{ 12/31 RPA CL} &= 612,000 = 90\% [680,000] \\ 12/31 \text{ asset value} &= 556,400 = [(1.07)(520,000)] \\ \text{RPA '94 FFL floor} &= 55,600\end{aligned}$$

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Problem 5 – Page 2

The §412 FFL credit is defined as the excess of the Accumulated funding deficiency (AFD) based on zero contribution and zero credit balance over the FFL. The AFD equals the previously calculated charges of 83,711. Since the AFD of 65,805 exceeds the FFL of 55,600, there is a FFL credit in the MFSA for the excess of 10,205.

Now you can finalize the MFSA:

2005 Minimum Funding Standard Account			
Charges		Credits	
Normal Cost	60,000	Credit Balance	0
Net amortization	1,500	01/01/05 contribution	50,000
		03/15/06 contribution	1,000
		09/15/06 contribution	x
		12/31/06 FFL credit	10,205
7% interest	4,305	7% interest	3,500
Total charges	<u>65,805</u>	Total credits	<u>x+64,705</u>

The minimum contribution at 12/31/05 is 65,805 - 64,705, or 1,100.

Answer is B

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Problem 6 – Page 1

Similar to 2002 #21

The approved asset valuation methods in Section 3 of Revenue Procedure 2000-40 are:

- (11) Average value without phase-in
- (12) Average value with phase-in
- (15) Smoothed market value without phase-in
- (16) Smoothed market value with phase-in
- (17) Average value with alternative phase-in.

The plan can change to these asset valuation methods, and get automatic approval for the change in method. The 1.412(c)(2)-1 regulation describes the general requirements for an acceptable asset valuation method.

The Study Note (E2A-62-02) discusses the theory behind various methods, as well as variations which may be acceptable under the regulation, but which do not get automatic approval. If you change to one of these other methods, you would have to apply for approval under Revenue Procedure 2000-40.

For all of these methods, a corridor must be applied for the final actuarial value of assets. Based on the general conditions for the EA exams, you are not working on a multi-employer plan. The final actuarial value of assets can't be lower than 80% of market value, nor greater than 120% of market value. For a multi-employer plan, there is a wider corridor available.

(15) Smoothed market value without phase-in

This method is described in broad terms in Revenue Procedure 2000-40. The Study Note (E2A-62-02) gives a numerical example of the calculation on page 3-4. The basic idea is that you determine a gain or loss each year based on the expected value of assets versus the market value.

The actuarial value of assets is calculated using decreasing fractions of each of the prior year's gain or loss. With a four year average, the fractions are $\frac{3}{4}$, $\frac{2}{4}$, and $\frac{1}{4}$. With a three year average, the fractions are $\frac{2}{3}$ and $\frac{1}{3}$.

First you must calculate the expected market value of assets each year:

Year	2002	2003	2004
Market value at 1-1	5,000,000	4,100,000	3,600,000
Full year of interest at 7%	350,000	287,000	252,000
Contributions	200,000	300,000	400,000
Benefit payments	(300,000)	(300,000)	(300,000)
Half year of interest (simple)	(3,500)		3,500
Expected value at 12-31	5,246,500	4,387,000	3,955,500

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Problem 6 – Page 2

2004 AAV

The next step is the calculation of the actuarial value of assets at 01-01-2004 based on Method 15 (smoothed market value):

	2002	2003	2004
Market value at 1-1	5,000,000	4,100,000	3,600,000
Expected value at 1-1	5,000,000	5,246,500	4,387,000
Gain (loss)		(1,146,500)	(787,000)
Fraction		33.33%	66.67%
Unrecognized portion		(382,167)	(524,667)

The preliminary actuarial value of assets is the final market value at 1-1-2004 minus the total unrecognized portion of the G/L:

$$4,506,833 = 3,600,000 - (-382,167 - 524,667)$$

This asset value must be compared to the 80% and 120% corridors. The final actuarial value of assets at 1-1-2004 is limited to the 120% of market value corridor:

$$4,320,000 = 120\%(3,600,000)$$

2005 AAV

One key point of the problem is that it does not ask for the 2004 G/L based on the market value of assets. It asks for the 2004 G/L based on the actuarial value of assets. You must also calculate the actuarial value of assets at 01-01-2005, and then determine the amount of the G/L for 2004.

The next step is the calculation of the actuarial value of assets at 01-01-2005 based on Method 15 (smoothed market value):

	2003	2004	2005
Market value at 1-1	4,100,000	3,600,000	4,500,000
Expected value at 1-1	4,100,000	4,387,000	3,955,500
Gain (loss)		(787,000)	544,500
Fraction		33.33%	66.67%
Unrecognized portion		(262,333)	363,000

The preliminary actuarial value of assets is the final market value at 1-1-2005 minus the total unrecognized portion of the G/L:

$$4,399,333 = 4,500,000 - (-262,333 + 363,000)$$

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Problem 6 – Page 3

This asset value must be compared to the 80% and 120% corridors. The final actuarial value of assets at 1-1-2005 is well within both the 80% and 120% of market value corridors.

The expected actuarial value of assets at 1-1-2005 is calculated as follows:

$$\begin{aligned} 2005 {}_e\text{AAV}_1 &= (1.07)(\text{AAV}_0) + \text{net cash flows with interest at 7\%} \\ &= 1.07 * 4,320,000 + 400,000 - 300,000 + 3,500 \\ &= 4,725,900 \end{aligned}$$

$$\begin{aligned} \text{AAV loss} &= 4,725,900 - 4,399,333 \\ &= 326,567 \end{aligned}$$

Answer is B

NOTE:

If you used compound interest to calculate the expected market and actuarial values, the asset values are slightly different:

2004 AAV	4,320,000
2005 AAV	4,399,294
2005 ${}_e\text{AAV}$	4,725,841
AAV loss	326,547

As expected, the final result must be in the same answer range.

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Problem 7

Similar to 2004 #29

The key to this problem is knowing the rules in Revenue Procedure 2000-40 for changes in cost method, asset valuation method, and valuation date.

I. FALSE

Under Section 3(13), you can only get automatic approval to change the valuation date to the first day of the plan year.

II. FALSE

This tests a small detail in RP 2000-40. In Section 3(14), it allows you to stop using the one year term cost method to value ancillary benefits.

III. FALSE

In Section 3(5), it allows you to change to the Level Dollar Individual Aggregate Method. There are two requirements that must be met:

- Actuarial Value of Assets must not be less than the Present Value of Benefits for Inactive Participants
- "Adjusted assets" must not be less than zero

"Adjusted assets" equal actuarial value of assets + Sum of outstanding balance of Special Bases - Credit balance (or + Funding deficiency) - Liabilities for inactive participants, where Special Bases are those due to funding waivers (412(b)(2)(C)), switchback, shortfall, or transition.

The assets of 350,000 do not exceed the 400,000 liability for the inactives.

None are true

Answer is A

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Problem 8 – Page 1

The key to this problem is recognizing that you should calculate the gain / loss for 2004. Based on the default exam conditions, there are no pre-retirement decrements. Since the contribution is paid at 12/31, the investment G/L is zero. But the plan benefit may be pay related, which could be a source of G/L.

Since the investment G/L is zero, you can use the non-investment G/L formulas:

$$\begin{aligned}\text{Non-inv G/L} &= {}_c\text{AL}_1 - \text{AL}_1 \\ 01/05 {}_c\text{AL}_1 &= (1+i) * (\text{NC}_0 + \text{AL}_0) - (\text{actual benefit payments} + \text{interest}) \\ &= 1.07 * (50,000 + 100,000) - \text{zero} \\ &= 160,500\end{aligned}$$

$$\begin{aligned}01/05 \text{ 8\% AL} &= 140,000 && (\text{given}) \\ 412 \text{ Assm base} &= -30,000 && (\text{given})\end{aligned}$$

$$\begin{aligned}01/05 \text{ 7\% AL} &= 140,000 + 30,000 \\ &= 170,000\end{aligned}$$

$$\begin{aligned}\text{Non-inv Gain} &= {}_c\text{AL}_1 - \text{AL}_1 \\ &= 160,500 - 170,000 \\ &= -9,500 \quad \rightarrow \quad \text{Loss of 9,500}\end{aligned}$$

Now you need to recalculate the amortization payment for the IAL at 8%, and determine the amortization payments for both the Loss base and the Assumption change base:

Amortization base	Remaining Years 01/01/05	Outstanding 7%base at 01/01/05	8% amortization at 01/01/05
1-1-2004 Initial AL	30-(2005-2004) = 29	$100,000 * (\ddot{a}_{\overline{29} .07} / \ddot{a}_{\overline{30} .07}) = 98,941$	$98,941 / \ddot{a}_{\overline{29} .08} = 8,210$
1-1-2005 Assump base	10	-30,000	$-30,000 / \ddot{a}_{\overline{10} .08} = -4,140$
1-1-2005 Loss base	5	9,500	$9,500 / \ddot{a}_{\overline{5} .08} = 2,203$

The final step is calculation of the credit balance at 12/31/2004. You can determine this based on the actuarial equation of balance:

$$\begin{aligned}12/04 {}_c\text{UAL}_1 &= {}_c\text{AL}_1 - \text{AAV}_1 \\ &= 160,500 - 65,000 \\ &= 95,500\end{aligned}$$

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Problem 8 – Page 2

$$12/04 \text{ } \epsilon \text{UAL}_1 = 12/31/04 \text{ O/S } \$412 \text{ bases - CB - ARA}$$

$$95,500 = 98,941 - \text{CB}$$

$$\text{CB} = 98,941 - 95,500$$

$$= 3,441$$

Now you can set up the MFSA and calculate the 12/31/05 minimum contribution:

2005 Minimum Funding Standard Account			
Charges		Credits	
Normal Cost	40,000	Credit Balance	3,441
IAL amortization	8,210	Assm amortization	4,140
Loss amortization	2,203	12/31/04 minimum	x
8% interest	4,033	8% interest	606
Total charges	<u>54,446</u>	Total credits	<u>x + 8,188</u>

Since this is almost a brand new plan, you can ignore the FFL calculations. It would be VERY unusual for it to affect the minimum contribution calculation. The minimum contribution at 12/31/05 is $46,259 = 54,446 - 8,188$.

Answer is D

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Problem 9

Similar to 2004 #14

One key to this problem is handling the credit balance in the normal cost calculation for 2005. Another key is that there is no interest discount applied to the contribution paid after the end of the 2004 plan year. It simply doesn't earn any interest in the MFSA.

Since the 12/31/04 minimum contribution is 200,000, you know that $(1+i) \cdot (NC-CB) = 200,000$:

2004 Minimum Funding Standard Account				
	Charges		Credits	
Normal Cost		????	Credit Balance	CB
			07/01/04 contribution	140,000
			11/01/04 contribution	45,000
			06/30/05 contribution	90,000
7% interest		?????	7% interest	$5,425 + .07(CB)$
Total charges	$200,000 + 1.07(CB)$		Total credits	$280,425 + 1.07(CB)$

The interest in the MFSA is calculated using simple interest on the 2004 contributions:

$$5,425 \text{ interest} = .07(6/12)(140,000) + .07(2/12)(45,000)$$

The credit balance at 12/31/04 is 80,425. Now you can calculate the Aggregate PVNC:

$$\begin{aligned} \$412 \text{ PVNC} &= \text{PVB} - \text{AAV} - (\text{O/S } \$412 \text{ bases} - \text{CB}) && \text{NOTE: No ARA under Aggregate} \\ &= 1,200,000 - 890,000 - (0 - 80,425) \\ &= 390,425 \end{aligned}$$

$$\begin{aligned} \text{PVE} / \text{E} &= 15,312,500 / 875,000 \\ &= 17.50 \end{aligned}$$

$$\begin{aligned} \$412 \text{ NC} &= \text{PVNC} / (\text{PVE}/\text{E}) \\ &= 390,425 / 17.50 \\ &= 22,310 \end{aligned}$$

$$\begin{aligned} 12/31 \text{ NC} &= 1.07(22,310) \\ &= 23,872 \end{aligned}$$

Answer is E

NOTE:

If you used compound interest, the credit balance and normal cost values are slightly different:

$$\begin{aligned} \text{Interest} &5,327 = [(1.07)^{(6/12)} - 1](140,000) + [(1.07)^{(2/12)} - 1](45,000) \\ \text{Credit balance} &80,327 \\ 12/31 \text{ NC} &23,866 \end{aligned}$$

As expected, the final result must be in the same answer range of E.

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Problem 10 – Page 1

Similar to 2004 #32

You are told to calculate the deductible limit using the Fresh Start approach. You need to calculate the amount of the unfunded accrued liability (UAL) to calculate the limit adjustments.

The key point of this problem is whether you know how to calculate items under §404 when you have a contribution that has not yet been deducted. The method of calculation of the FFL when you have a non-deducted contribution is outlined in Revenue Ruling 82-125.

Based on the default exam conditions, the AAV given in problems is the appropriate value for minimum funding calculations. This is consistent with the description of the assets in the problem.

If a contribution has been paid to the trust for a prior plan year, it is considered as part of the §412 assets, regardless of whether or not it has been deducted. If a contribution has been paid to the trust for the current plan year, it should NOT be considered as part of the §412 assets for the current plan year valuation.

If a contribution has been paid to the trust for a prior plan year, it is considered as part of the §404 assets only if it has been deducted for a prior tax year. If a contribution has been paid to the trust for the current plan year, it can be considered as part of the §404 assets for the current tax year, as long as it has been deducted for a prior tax year.

Here is the relationship between the §404 asset definition and the §412 asset definition:

$$\begin{aligned}\$404 \text{ AAV} &= \text{AAV} - \text{NDC} \\ &= 740,000 - 30,000 \\ &= 710,000\end{aligned}$$

The deductible limit is defined as the normal cost plus limit adjustments brought forward with interest to the earlier of the end of the plan year, or the end of the tax year. Under Fresh Start, the limit adjustments equal a 10 year amortization of the UAL:

$$\$412 \text{ UAL} = \text{AL} - \text{AAV}$$

$$\begin{aligned}\$404 \text{ UAL} &= \text{AL} - \$404 \text{ AAV} \\ &= 1,000,000 - 710,000 \\ &= 290,000\end{aligned}$$

$$\begin{aligned}\text{Deductible limit} &= 1.07 * (25,000 + 290,000 \div \ddot{s}_{\overline{10}|.07}) \\ &= 68,039\end{aligned}$$

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Problem 10 – Page 2

The second step is usually to check the Full Funding Limitation under §404. The examples in Revenue Ruling 82-125 show how to calculate the Full Funding Limitation when you have a non-deductible contribution in the assets. The NDC should not get any interest credit:

$$\text{\$404 ERISA FFL} = (1+i)(\text{NC}+\text{AL}) - (1+i)[\text{lesser of MV, AAV}] + \text{NDC}$$

Based on the size of the UAL, it should be clear that the FFL will not reduce the deductible limit of 68,039.

Now you usually check the §412 minimum contribution to see if it is greater. Here you are given the minimum contribution as 40,000, which won't affect the deductible limit.

The main point of the problem is that you should calculate the §404 unfunded current liability (UCL). There are no specific details of how to calculate this value in §404, but it is generally done on an end of year basis.

You need to follow the same logic as used above for the §404 FFL. You should not credit any interest on the NDC, which produces a slightly lower deductible limit.

$$\begin{aligned}\text{\$404 "RPA 94" UCL} &= 1.00 (12/31 \text{ CL}) - (1+i)*(\text{AAV}) + \text{NDC} && \text{(if no benefit payments)} \\ &= 1,306,000 - 1.07*(740,000) + 30,000 \\ &= 544,200\end{aligned}$$

The 404 UCL produces the final result for the deductible limit, since it exceeds the previously calculated value of 68,039.

Answer is D

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Problem 11

Similar to 2003 #44

The key to this problem is handling the multiple retirement decrements correctly in calculating the present value of the future benefits.

Age 60 at 01/01/05
Service 28 years

Under the old assumptions, the present value of benefits allows for the participant to retire immediately:

$$\begin{aligned} \text{PVB} &= \text{ERB} * \ddot{a}_{60}^{(12)} \\ &= 12,000 * [1 - 5(3\%)] * 11.59 \\ &= 10,200 * 11.59 \\ &= 118,218 \end{aligned}$$

With multiple retirement decrements, the accrued liability must be calculated as a complicated summation:

$$\text{PVB} = \sum_{t=0}^2 v^t p_{60}^{(T)} q_{60+t}^{(r)} \text{ERB}_{60+t} \ddot{a}_{60+t}^{(12)}$$

The unreduced benefit is available at retirement ages 62 and above, when the participant has completed 30 years of service. You must calculate the reduced benefit available at age 61:

$$\text{ER ben at 61} \quad 11,880 = 13,500[1 - 4(3\%)]$$

Now you can evaluate the summation shown previously:

	(1)	(2)	(3)		(4)	(5)	(6)
t	<u>60+t</u>	<u>v^t</u>	<u>$p_{60}^{(T)}$</u>	<u>$q_{60+t}^{(r)}$</u>	<u>$p_{60+t}^{(T)}$</u>	<u>ERB_{60+t}</u>	<u>$\ddot{a}_{60+t}^{(12)}$</u>
0	60	1.0000	1.000	0.50	0.50	10,200	11.59
1	61	.9346	0.500	0.80	0.20	11,880	11.41
2	62	.8734	0.100	1.00	0.00	15,000	11.23
							<u>14,713</u>
							124,495

The increase in the PVB is $6,277 = 124,495 - 118,218$.

Answer is C

NOTES:

1. The answer ranges seem VERY wide for this problem.
2. For much harder problems that require calculation of temporary annuities with multiple retirement decrements, see EA-1B 1999 #09 and EA-1B 1994 #15.

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Problem 12

Revised 08/11/14

The key to this problem is *Not Freaking Out* when you see questions about excise taxes on prohibited transactions or asset reversions.

Apparently someone on the exam committee has been skipping their medications, since these items are not on the syllabus for EA-2A.

I. FALSE

The excise tax on a funding deficiency is 10% for single employer plans. For multiemployer plans, the excise tax is 5%.

See IRC 4971(a).

II. TRUE

See IRC 4975(a).

not on the syllabus for EA-2A!

III. TRUE

See IRC 4980(a) and IRC 4980(d)(1).

not on the syllabus for EA-2A!

Only II and III are true

Answer is C

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Problem 13 – Page 1

Similar to 2004 #16

This problem gives you the values needed to calculate the Deficit Reduction Contribution (DRC) and the §412(l) additional funding charge (AFC). The key to this problem is calculating the §412(l) charge. Since the Gateway FCL% is less than 80%, the plan is subject to §412(l).

The §412(l) AFC equals the Unpredictable Contingent Event amount plus the excess, if any, of the DRC over the §412(b) normal cost plus all amortization charges and credits. The DRC is defined as the sum of the unfunded old liability amount (UOLA), the unfunded new liability amount (UNLA), and current liability normal cost.

The unfunded current liability is defined as the excess of the current liability over the actuarial asset value, reduced by the credit balance. The definition also specifies that any debit balance should be treated as zero for this purpose.

$$\begin{aligned}\text{UCL} &= \text{CL} - (\text{AAV} - \text{CB}) \\ &= 2,000,000 - (1,150,000 - 30,000) \\ &= 880,000\end{aligned}$$

The unfunded new liability (UNL) is usually calculated as the excess of the unfunded current liability (UCL) over the remaining portion of the unfunded old liability (UOL) plus any unpredictable contingent event liability.

In this problem you are given the UOL, and you must calculate the UNL:

$$\begin{aligned}\text{UOL} &= 50,000 \text{ (given)} \\ \text{UNL} &= \text{UCL} - \text{UOL} - \text{UCEL} \\ &= 880,000 - 50,000 - 0 \\ &= 830,000\end{aligned}$$

The UOLA equals the amortization of the remaining portion of the unfunded old liability over a period that was 18 years at 01/01/89. At 01/01/04, there are $3 = 18 - (2004 - 1989)$ years left.

$$\begin{aligned}\text{UOLA} &= 50,000 / \ddot{s}_{\overline{3}|.06} \\ &= 25,728\end{aligned}$$

The unfunded new liability amount (UNLA) is defined as the unfunded new liability times the applicable percentage, which is 30% - 40% (FCL% - 60%). In this problem, you are given this formula for the applicable percentage.

When the FCL% is less than 60%, the applicable percentage for the UNLA is capped at 30%. When calculating the FCL%, any debit balance is treated as a zero CB. Based on the Schedule B instructions, the FCL% should be rounded to the nearest .01%.

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Problem 13 – Page 2

$$\begin{aligned}\text{FCL\%} &= (\text{AAV} - \text{CB}) / \text{CL} \\ &= (1,150,000 - 30,000) / 2,000,000 \\ &= 56.00\%\end{aligned}$$

$$\begin{aligned}\text{APP\%} &= .30 - .40 [\text{zero}] \\ &= 30.00\%\end{aligned}$$

$$\begin{aligned}\text{UNLA} &= 830,000 * 30.00\% \\ &= 249,000\end{aligned}$$

$$\begin{aligned}\text{DRC} &= \text{UOLA} + \text{UNLA} + \text{CLNC} \\ \text{DRC} &= 25,728 + 249,000 + 85,000 \\ &= 359,728\end{aligned}$$

You must subtract the §412 normal cost plus all amortization charges from the DRC to calculate the §412(l) AFC. Then bring the §412(l) charge forward to the end of the year with interest at the current liability rate of 6%.

You need to determine the §412 amortization payment for the IAL:

$$\begin{aligned}\text{Amort} &= 1,250,000 / \ddot{a}_{30|.07} \\ &= 94,143\end{aligned}$$

$$\begin{aligned}01/01/05 \text{ §412(l) AFC} &= \text{UCEA} + [\text{DRC} - (\text{§412 NC} + \text{§412 amortizations})] \\ &= 0 + [359,728 - (75,000 + 94,143)] \\ &= 190,585\end{aligned}$$

$$\begin{aligned}12/31/05 \text{ §412(l) AFC} &= 190,585 * 1.06 \\ &= 202,020\end{aligned}$$

Based on Revenue Ruling 96-21, this end of year §412(l) charge should be limited to the "end of year UCL". For the sake of speed in working problems, you can simply look at the UCL at the start of the year and see that it will not be anywhere near the magnitude of the §412(l) charge. In general, the "end of year UCL" should never be less than the AFC.

With less than 150 plan participants, you must pro-rate the §412(l) AFC. The pro-rata is based on the highest number of plan participants on any day in the prior plan year. You are given the highest participant count for the 2002 plan year as 140.

$$\begin{aligned}12/31/03 \text{ §412(l) AFC} &= 202,020 * [2\% * (140-100)] \\ &= 202,020 * .80 \\ &= 161,616\end{aligned}$$

Answer is C

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Problem 14

The key to this problem is knowing the gain / loss formulas. In addition, you must allow for the fact that there is still a liability for Jones' surviving spouse after Jones' death.

$$\begin{aligned}\text{Non-inv G/L} &= {}_e\text{AL}_1 - \text{AL}_1 \\ {}_e\text{AL}_1 &= (1+i)(\text{AL}_0 + \text{NC}_0) - (\text{actual benefit payments} + i)\end{aligned}$$

Since these participants are retired, their NC is zero, and their AL is the same as their PVB. The easy part is calculating the PVB at 01/01/05:

Name	Jones	Brown	Total
01/01/05 Age	N/A	61	
Spouse's Age	56	N/A	
Benefit	N/A	30,000	
Spouse's Benefit	10,000	N/A	
Payment form	Life annuity	Life annuity	
Annuity factor	11.60	10.60	
01/01/05 AL	11.60(10,000) = 116,000	10.60(30,000) = 318,000	434,000

Now you need to go back to 01/01/04 to calculate the accrued liability values:

Name	Smith	Jones	Brown	Total
01/01/05 Age	65	60	60	
Spouse's Age	N/A	55	N/A	
Benefit	60,000	20,000	30,000	110,000
Payment form	Life annuity	50% J&S	Life annuity	
Annuity factor	9.70	11.90	10.80	
01/01/04 AL	9.70(60,000) = 582,000	11.90(20,000) = 238,000	10.80(30,000) = 324,000	1,114,000

$$\begin{aligned}{}_e\text{AL}_1 &= (1+i)(\text{AL}_0 + \text{zero}) - (\text{actual benefit payments} + i) \\ &= 1.07(1,114,000) - 1.07(110,000) \\ &= 1,106,380\end{aligned}$$

$$\begin{aligned}\text{Gain} &= 1,106,380 - 434,000 \\ &= 672,380\end{aligned}$$

Answer is E

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Problem 15

I. FALSE

RPA '94 added §412(c)(12) to the Internal Revenue Code, which states “In determining projected benefits, the funding method ... shall anticipate benefit increases ...” This requires that, for collectively bargained plans, the minimum funding requirement is determined based on the ultimate level of benefits.

The key point of this problem is that this is NOT a collectively bargained plan. As a result, the plan can NOT allow for benefits that become effective in future plan years.

See the regulation at 1.412(c)(3)-1(d)(1)(i).

II. FALSE

1.412(c)(3)-1(d)(2), the regulation allows you to include current employees who have not yet satisfied the age and service requirements of the plan. It does NOT allow you to anticipate future participants who are not in the service of the employer on the plan's valuation date.

III. FALSE

Here is what it says in the regulation at 1.412(c)(3)-1(c)(1):

“Under a reasonable funding method, all liabilities of the plan for benefits, whether vested or not, must be taken into account.”

None of these items are true

Answer is A

NOTE:

At 1.412(c)(3)-1(c)(3)(ii), it allows you to exclude plan participants who have not yet satisfied the age and service requirements of section 410.

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Problem 16 – Page 1

Since the cost method is Projected Unit Credit (PUC), you should calculate the gain / loss for 2004. Other than that, you don't actually use the PUC method for any calculations in this problem.

Now you need to calculate the amortization payment for the IAL, based on the outstanding 412 base at 01/01/04:

$$\text{O/S 7\% base} = \text{IAL} \left(\ddot{a}_{\overline{28}|.07} / \ddot{a}_{\overline{30}|.07} \right)$$

$$250,000 / \ddot{a}_{\overline{28}|.07} = \text{IAL} / \ddot{a}_{\overline{30}|.07}$$

Now determine the outstanding bases and amortization payments for both of the Loss bases:

Amortization base	Amortization payment	Remaining Years 01/01/05	Outstanding base at 01/01/05
1-1-2002 Initial AL	$250,000 / \ddot{a}_{\overline{28} .07} = 19,250$	$27 = 30 - (2005 - 2002)$	$246,902 = 19,250 * \ddot{a}_{\overline{27} .07}$
1-1-2003 Loss base	$50,000 / \ddot{a}_{\overline{5} .07} = 11,397$	$3 = 5 - (2005 - 2003)$	$32,002 = 11,397 * \ddot{a}_{\overline{3} .07}$
1-1-2004 Loss base	$30,000 / \ddot{a}_{\overline{5} .07} = 6,838$	$4 = 5 - (2005 - 2004)$	$24,783 = 6,838 * \ddot{a}_{\overline{4} .07}$
Total O/S bases			303,688

The final step is calculation of the 2004 G/L. You can determine this based on the actuarial equation of balance. Since the minimum contribution was paid at 12/31/04, the credit balance is zero at 01/01/05.

$$\begin{aligned} \text{UAL}_1 &= \text{O/S } \$412 \text{ bases} - \text{CB} - \text{ARA} \\ 275,000 &= 303,688 + \text{GAIN} - 0 - 0 \end{aligned}$$

$$\begin{aligned} \text{GAIN} &= 28,688 \\ \text{Gain amort} &= 28,688 / \ddot{a}_{\overline{5}|.07} \\ &= 6,539 \end{aligned}$$

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Problem 16 – Page 2

Now you can set up the MFSA and calculate the 12/31/05 minimum contribution:

2005 Minimum Funding Standard Account			
Charges		Credits	
Normal Cost	95,000	Credit Balance	0
IAL amortization	19,250	Gain amortization	6,539
Loss amortization	11,397		
Loss amortization	6,838	12/31/05 minimum	x
7% interest	9,274	7% interest	458
Total charges	<u>141,759</u>	Total credits	<u>x + 6,997</u>

Since you have no asset values, you can ignore the FFL calculations. The minimum contribution at 12/31/05 is $134,763 = 141,759 - 6,997$.

Answer is A

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Problem 17

Similar to 2003 #4

The key to this problem is calculating the death benefit available at each age. Then you use those benefits in a typical expression for the present value of an ancillary benefit.

The problem asks for the present value of Smith's death benefits. The mortality decrements are assumed to occur at the end of the year.

Age 63 at 01/01/05

Service is 40 years

$$\begin{aligned}\text{PV of death benefits} &= (85\%) \sum_{t=0}^1 v^{t+1} {}_t p_{63}^{(T)} q_{63+t}^{(d)} (\text{Death benefit}_{63+t+1}) (\text{PV factor}_{63+t+1}) \\ &= .85 [v^1 {}_0 p_{63}^{(T)} q_{63}^{(d)} * \text{Death ben}_{64} * \text{PV fact}_{64} + v^2 {}_1 p_{63}^{(T)} q_{65}^{(d)} * \text{Death ben}_{65} * \text{PV fact}_{65}]\end{aligned}$$

Note the subscripts in the preceding line. Since decrements occur at the end of the year, Smith's spouse will be age 64 if Smith dies during the first year.

You should allow for the accrual of one more year of service (to the end of the year) in determining the death benefit for Smith's spouse. If Smith dies in the first year, both Smith and their spouse are age 64 at the end of the year:

$$\begin{aligned}\text{Death ben}_{64} &= 50\% * (40+1)(12)(50)[1-4\%] \\ &= 11,808\end{aligned}$$

$$\begin{aligned}\text{Death ben}_{65} &= 50\% * (40+2)(12)(50) \\ &= 12,600\end{aligned}$$

$$\begin{aligned}\text{PV of death benefits} &= .85[(1.07)^{-1}(1.0)(.05)(11,808)(9.90) + (1.07)^{-2}(1-.05)(.05)(12,600)(9.70)] \\ &= .85[5,463 + 5,071] \\ &= 8,953\end{aligned}$$

Answer is A

NOTE:

I made no calculation for the probability of the spouse's survival to the point of death. In most pension valuation software, the marriage assumptions are similar to those described in the problem:

“Marriage - 85% of participants are married at time of death”

In effect, this assumes that any spouse who dies will be replaced “automatically”.

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Problem 18

Similar to 2003 #28

The key to this problem is knowing how to handle the change in the interest rate under §412. You have to determine the outstanding amount of several §412 bases at 7.5%, and re-determine the amortization of all the bases at the new 7% interest rate.

Another point of this problem is whether you know the amortization periods for multiemployer plans. These plans were not subject to the requirements of OBRA '87, so the amortization periods reflect the pre-OBRA '87 rules. The assumption change base will be amortized over 30 years instead of 10 years. The G/L bases will be amortized over 15 years.

Amortization base	Remaining years	7.5% Outstanding base	Old Amortization Amount at 7.5%
01/01/2004 Loss base	14 = 15-(2005-2004)	$91,258 = 10,000 * \ddot{a}_{\overline{14} .075}$	10,000
01/01/2005 Loss base	15	300,000	$300,000 / \ddot{a}_{\overline{15} .075} = 31,615$
Total			41,615

Amortization base	Remaining years	7.5% Outstanding base	New Amortization Amount at 7.0%
01/01/2004 Loss base	14 = 15-(2005-2004)	$91,258 = 10,000 * \ddot{a}_{\overline{14} .075}$	$91,258 / \ddot{a}_{\overline{14} .07} = 9,752$
01/01/2005 Loss base	15	300,000	$300,000 / \ddot{a}_{\overline{15} .07} = 30,784$
01/01/2005 Assum base	30	100,000	$100,000 / \ddot{a}_{\overline{30} .07} = 7,531$
Total			48,067

The increase in the 01/01/05 minimum due to the interest change is the sum of the increase in the normal cost, and the increase in the amortization payments:

$$\begin{aligned}
 \Delta \text{ Amort} &= 48,067 - 41,615 \\
 &= 6,452 \\
 \Delta \text{ NC} &= 20,000 \quad (\text{given}) \\
 \Delta \text{ 01/05 Min} &= 26,452
 \end{aligned}$$

Answer is A

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Problem 19 – Page 1

Similar to 2003 #25

The key to this problem is realizing that you need to calculate both the RPA Full Funding Limitation (FFL) and the ERISA FFL. This is the first exam problem where you have to calculate the value of the current liability “from scratch”, since you are given the annuity value at age 65 under the current liability assumptions. In all other prior exam problems where you calculate the RPA FFL, you have always been given a value for the current liability.

The calculation of the current liability is not clearly defined in any regulation. In general, most actuaries calculate the current liability like the Unit Credit accrued liability. In the problem, the calculations are fairly simple. The reason is that, based on exam condition 19, you should assume there are no pre-retirement decrements.

RPA FFL - Current Liability - 6% interest

Age 55 at 01/01/05

Entry age 34

$$\begin{aligned}\text{Accrued Ben} &= 50(12)(55-34) \\ &= 12,600\end{aligned}$$

$$\begin{aligned}\text{Current liab} &= \text{UC AL} = \text{PV of AB} \\ &= 12,600(D_{65} / D_{55}) \ddot{a}_{65}^{(12)} \\ &= 12,600(1.06)^{-10}(10.90) \\ &= 76,690\end{aligned}$$

$$\begin{aligned}\text{UC NC} &= \text{PV of } \Delta \text{AB} \\ &= 600(D_{65} / D_{55}) \ddot{a}_{65}^{(12)} \\ &= 76,690 / 21 \\ &= 3,652\end{aligned}$$

$$\begin{aligned}\S 412 \text{ "RPA 94" FFL} &= .90 (12/31 \text{ CL}) - (1+i) * (\text{AAV}) && \text{(if no benefit payments)} \\ &= .90 * [(1.06)(3,652 + 76,690) - 0 \text{ BP}] - [(1.07)(70,000) - 0 \text{ BP}] \\ &= 1,746\end{aligned}$$

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Problem 19 – Page 2

ERISA FFL - Entry Age Normal - 7% interest

Since this plan uses an aggregate type cost method, the ERISA FFL must be calculated using the entry age normal cost and accrued liability. You have to do a separate Entry Age Normal valuation to generate the ERISA FFL.

In general, the Entry Age Normal Cost (EANC) is defined as the present value of benefits at entry age, divided by a temporary annuity at entry age. If the benefit is defined based on pay, the EANC is calculated as a level percentage of salary, and the temporary annuity will include a salary scale.

The plan formula accrues benefits for all years of service, so you use the participant's age at hire as EA in these formulas:

$$\text{Level \$ EANC: } PVB_{EA} / \ddot{a}_{EA:RA-EA}$$

Age 55 at 01/01/05

Entry age 34

$$\begin{aligned}\text{Proj Ben} &= 50(12)(65-34) \\ &= 18,600\end{aligned}$$

$$\begin{aligned}PVB \text{ at } 34 &= 18,600(D_{65} / D_{34}) \ddot{a}_{65}^{(12)} \\ &= 18,600(1.07)^{-31}(9.20) \\ &= 21,009\end{aligned}$$

The next step is calculation of the EA normal cost and accrued liability.

$$\text{Level \$ EANC: } PVB_{34} / \ddot{a}_{34:31}$$

$$\begin{aligned}EANC_{34} &= PVB_{34} / \ddot{a}_{31|.07} \\ &= 21,009 / 13.4090 \\ &= 1,567\end{aligned}$$

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Problem 19 – Page 3

Next, you can use the typical retrospective formula for the accrued liability. You should calculate the accumulated value of the EANC with interest and survivorship, from entry age to current age:

$$\begin{aligned}\text{EAN AL} &= \text{EANC}(\ddot{s}_{\overline{34:21}|}) \\ &= 1,567 * \ddot{s}_{\overline{21}|.07} \\ &= 75,214\end{aligned}$$

Finally, you have enough information to calculate the ERISA FFL:

$$\begin{aligned}\S 412 \text{ "ERISA" FFL} &= (1+i) * (\text{EA NC} + \text{EAN AL}) - (1+i) * [\text{lesser (MVA, AAV)} - \text{CB}] \\ &= 1.07 * (1,567 + 75,214 - (70,000 - 0)) \\ &= 7,256\end{aligned}$$

Answer is C

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Problem 20 – Page 1

Similar to 2004 #23

This problem gives you the values needed to calculate the Deficit Reduction Contribution (DRC) and the §412(l) additional funding charge (AFC). The key to this problem is calculating the §412(l) charge.

The first step in most problems is calculation of the Gateway test, to see if the plan is subject to §412(l). This problem simply tells you that the plan is subject to 412(l) for 2005.

The §412(l) AFC equals the Unpredictable Contingent Event amount plus the excess, if any, of the DRC over the §412(b) normal cost plus all amortization charges and credits. The DRC is defined as the sum of the unfunded old liability amount (UOLA), the unfunded new liability amount (UNLA), and current liability normal cost.

The unfunded current liability is defined as the excess of the current liability over the actuarial asset value, reduced by the credit balance. The definition also specifies that any debit balance should be treated as zero for this purpose.

$$\begin{aligned}\text{UCL} &= \text{CL} - (\text{AAV} - \text{CB}) \\ &= 11,200,000 - (10,000,000 - 300,000) \\ &= 1,500,000\end{aligned}$$

The unfunded new liability (UNL) is usually calculated as the excess of the unfunded current liability (UCL) over the remaining portion of the unfunded old liability (UOL) plus any unpredictable contingent event liability.

Since this is a plan established after OBRA '87, the original UOL is zero. Since the effective date is after 1994, the additional layer of the UOL is also zero.

The entire unfunded current liability will be considered as unfunded new liability. In this problem, you are told nothing about unpredictable contingent events. You must assume there are none.

$$\text{UOL} = \text{zero}$$

$$\begin{aligned}\text{UNL} &= \text{UCL} - \text{UOL} - \text{UCEL} \\ &= 1,500,000 - 0 - 0 \text{ (assumed)} \\ &= 1,500,000\end{aligned}$$

The unfunded new liability amount (UNLA) is defined as the unfunded new liability times the applicable percentage, which is 30% - 40% (FCL% - 60%). In this problem, you are given this formula for the applicable percentage.

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Problem 20 – Page 2

When the FCL% is less than 60%, the applicable percentage for the UNLA is capped at 30%. When calculating the FCL%, any debit balance is treated as a zero CB. Based on the Schedule B instructions, the FCL% should be rounded to the nearest .01%.

$$\begin{aligned}\text{FCL\%} &= (\text{AAV} - \text{CB}) / \text{CL} \\ &= (10,000,000 - 300,000) / 11,200,000 \\ &= 86.61\%\end{aligned}$$

$$\begin{aligned}\text{APP\%} &= .30 - .40 [.8661 - .60] \\ &= 19.356\%\end{aligned}$$

$$\begin{aligned}\text{UNLA} &= 1,500,000 * 19.356\% \\ &= 290,340\end{aligned}$$

With a zero UOL, the unfunded old liability amount (UOLA) is also zero.

$$\begin{aligned}\text{DRC} &= \text{UOLA} + \text{UNLA} + \text{CLNC} \\ \text{DRC} &= 0 + 290,340 + 100,000 \\ &= 390,340\end{aligned}$$

You must subtract the §412 normal cost plus all amortization charges from the DRC to calculate the §412(l) AFC. Then bring the §412(l) charge forward to the end of the year with interest at the current liability rate.

$$\begin{aligned}01/01/05 \text{ §412(l) AFC} &= \text{UCEA} + [\text{DRC} - (\text{§412 NC} + \text{§412 amortizations})]_0 \\ &= 0 + [390,340 - (150,000 + \text{zero})] \\ &= 240,340\end{aligned}$$

$$\begin{aligned}12/31/05 \text{ §412(l) AFC} &= 240,340 * 1.06 \\ &= 254,760\end{aligned}$$

Based on Revenue Ruling 96-21, this end of year §412(l) charge should be limited to the "end of year UCL". For the sake of speed in working problems, you can simply look at the UCL at the start of the year and see that it will not be anywhere near the magnitude of the §412(l) charge. In general, the "end of year UCL" should never be less than the AFC.

Answer is B

NOTE

In the AFC calculation, the net §412 amortizations can be negative, as shown in 2004 #23. Based on the Schedule B instructions, you should NOT limit the net §412 amortizations to zero.

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Problem 21 – Page 1

The key to this problem is knowing the basic definitions of the actuarial cost methods:

$$\ddot{Y} \text{ ILP NC} = \ddot{Y} \{PVB_X / \ddot{a}_{X:RA-X}\}$$

$$\text{AGG NC} = \{\ddot{Y} PVB_X - AAV\} / [\text{average } \ddot{a}_{X:RA-X}]$$

$$\text{FIL NC} = \{\ddot{Y} PVB_X - UAL - AAV\} / [\text{average } \ddot{a}_{X:RA-X}]$$

$$\ddot{Y} \text{ EAN NC} = \ddot{Y} \{PVB_{EA} / \ddot{a}_{EA:RA-EA}\}$$

$$\text{IND AGG NC} = \ddot{Y} \{ (PVB_X - \text{alloc AAV}) / \ddot{a}_{X:RA-X} \}$$

I. FALSE

The definitions can be simplified a bit. Based on a new plan established at 01/01/05, the assets are zero.

$$\ddot{Y} \text{ ILP NC} = \ddot{Y} \{PVB_X / \ddot{a}_{X:RA-X}\}$$

$$\text{AGG NC} = \{\ddot{Y} PVB_X\} / [\text{average } \ddot{a}_{X:RA-X}]$$

This idea has been tested several times on past exams. It is not likely that these normal costs would be equal.

II. TRUE

The definitions can be simplified a bit. Based on a new plan established at 01/01/05, the assets are zero.

$$\text{AGG NC} = \{\ddot{Y} PVB_X\} / [\text{average } \ddot{a}_{X:RA-X}]$$

$$\text{FIL NC} = \{\ddot{Y} PVB_X - UAL\} / [\text{average } \ddot{a}_{X:RA-X}]$$

The key point here is that the each participant's hire age and entry age are equal to their current age. As a result, the EAN accrued liability is zero, so the FIL UAL is also zero. This produces identical costs for the FIL and Aggregate methods.

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III. TRUE

The definitions can be simplified a bit. Based on a new plan established at 01/01/05, the assets are zero. Since both participants have been hired at 01/01/05, EA and X are equal.

$$\ddot{Y}^{EAN NC} = \ddot{Y} \left\{ PVB_X / \ddot{a}_{\overline{X:RA-X}|} \right\}$$

$$IND AGG NC = \ddot{Y} \left\{ PVB_X / \ddot{a}_{\overline{X:RA-X}|} \right\}$$

These two normal costs are both equal, based on the data given in the problem.

Only items II and III are true

Answer is C

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Problem 22 – Page 1

Similar to 2003 #19

The key to this problem is interpreting the information you are given. You have a large credit balance, and a large asset loss. You are NOT given the age of the participant, which is quite unusual.

The deductible limit is the normal cost plus limit adjustments brought forward with interest to the earlier of the end of the plan year, or the end of the tax year.

$$\text{Deductible limit} = 1.07(\text{NC} + \text{LA})$$

Most of the work in this problem is calculation of the limit adjustments. You are given the initial accrued liability (IAL), but you need to derive the amount of the G/L for 2004. You can use the actuarial equation of balance:

$$\begin{aligned} 01/01/05 {}_e\text{UAL} &= (1+i) * (\text{NC}_0 + \text{UAL}_0) - (\text{contrib} + i) \\ &= \text{O/S } \$412 \text{ bases} - \text{CB} - \text{ARA} && \text{(excluding G/L base)} \\ &= 8,265 \left(\frac{\ddot{a}_{29|.07}}{\ddot{a}_{30|.07}} \right) - 7,289 \\ &= 889 \end{aligned}$$

$$\text{Total G/L} = {}_e\text{UAL}_1 - \text{UAL}_1$$

Since you don't know the participant's age, you can't directly calculate the accrued liability (or the UAL) at 01/01/05. Based on the default exam conditions, there are no pre-retirement decrements. So you know that the AL at 01/01/05 is equal to the expected AL:

$$\begin{aligned} 01/01/05 \text{ AL} &= {}_e\text{AL}_1 \\ {}_e\text{AL}_1 &= (1+i) * (\text{NC}_0 + \text{AL}_0) - (\text{benefit payments} + \text{interest}) \end{aligned}$$

The only trick to evaluating this is getting the value of the 2004 normal cost. Since the cost method is Unit Credit, and the benefit accrues uniformly for all years of service, there is a simple relationship between the normal cost and the accrued liability:

$$\begin{aligned} 2004 \text{ NC} &= 2004 \text{ AL} / (01/01/04 \text{ past service}) \\ &= 8,265 / 4.0 \\ &= 2,066 \end{aligned}$$

$$\begin{aligned} 01/01/05 {}_e\text{AL}_1 &= (1+i) * (\text{NC}_0 + \text{AL}_0) - (\text{benefit payments} + \text{interest}) \\ &= 1.07 * (2,066 + 8,265) - 0 \\ &= 11,054 \end{aligned}$$

$$\begin{aligned} 01/01/05 \text{ UAL} &= \text{AL} - \text{AAV} \\ &= 11,054 - 8,000 \\ &= 3,054 \end{aligned}$$

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$$\begin{aligned}\text{Total G/L} &= {}_e\text{UAL}_1 - \text{UAL}_1 \\ \text{Loss base} &= 3,054 - 889 \\ &= 2,165\end{aligned}$$

To calculate the 2005 deductible limit, you also need the value of the 2005 normal cost. You can use the relationship between the normal cost and the accrued liability:

$$\begin{aligned}\text{2005 NC} &= \text{2005 AL} / (01/01/05 \text{ past service}) \\ &= 11,054 / 5.0 \\ &= 2,211\end{aligned}$$

$$\begin{aligned}\text{Limit adjust} &= \text{IAL} / \ddot{a}_{10|.07} + \text{Loss} / \ddot{a}_{10|.07} \\ &= 8,265 / 7.5152 + 2,165 / 7.5152 \\ &= 1,100 + 288 \\ &= 1,388\end{aligned}$$

Unfortunately, if you use the limit adjustments shown, you will get the wrong answer. The sneaky trick to this problem is that the limit adjustment is defined in the 1.404(a)-14 regulation as the lesser of two items:

- (i) Ten year amortization of the §404 base, or
- (ii) Outstanding amount of the §404 base.

The remaining amount at 01/01/05 of the 404 IAL base of 8,265 is the expected UAL of 889. That means that the total limit adjustment is reduced below 1,388:

$$\begin{aligned}\text{Limit adjust} &= 889 + 288 \\ &= 1,177\end{aligned}$$

$$\begin{aligned}\text{Deductible lim} &= (2,211 + 1,177) * (1.07) \\ &= 3,626\end{aligned}$$

Answer is C

NOTES:

1. You could calculate the expected UAL at 01/01/05 by writing down the values from 2004:

$$\begin{aligned}{}_e\text{UAL} &= 1.07 * ((8,265/4) + 8,265 - 0) - 1.07(9,500) \\ &= 889\end{aligned}$$

2. You could calculate the NC at 01/01/05 by writing down the expected value from 2004:

$$\begin{aligned}01/01/05 \text{ NC} &= {}_e\text{NC}_1 \\ {}_e\text{NC}_1 &= (1+i)*(NC_0) && \text{(no pre-retirement decrements)} \\ &= 1.07(2,066) \\ &= 2,211\end{aligned}$$

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Problem 23 – Page 1

Similar to 2003 #36

Revised 10/03/06

This is only the second problem on split funding since 1998 EA-1B exam. This is the first problem on split funding where the actuarial assumptions include a salary scale.

Without split funding, the Aggregate cost method definitions are:

$$\begin{aligned}\$412 \text{ PVNC} &= \text{PVB} - \text{AAV} - (\text{O/S } \$412 \text{ bases} - \text{CB}) && \text{NOTE: no ARA under Aggregate} \\ \text{AGG NC} &= \text{PVNC} / \left(\text{average } \ddot{a}_{\overline{\text{X:RA-X}}|} \right)\end{aligned}$$

The basic idea of a split funded plan is that the plan purchases insurance contracts to provide the death benefits under the plan. All other plan benefits are funded through the normal cost. When you determine the normal cost, you can use the cash surrender value (CSV) of the insurance contract at retirement age as an asset.

Prior exam questions asked for the calculation of the side fund normal cost, or the total normal cost. The side fund normal cost refers to the normal cost calculated by applying the cost method. The total cost of the plan is the sum of the side fund normal cost and the insurance premium.

Age 35 at 01/01/05
Future service 30

2004 pay 75,000 (age 34 pay)
Age 64 pay 182,045 = $75,000(1.03)^{30}$
Age 65 FAE 182,045

Proj ben at 65 = $50\%(182,045)$
= 91,022

In this problem, all the insurance calculations have already been done for you. You just need to know how to use the various items:

$$\begin{aligned}\text{PVB at 65} &= 91,022 \ddot{a}_{65}^{(12)} \\ &= 91,022(10.0) \\ &= 910,223\end{aligned}$$

$$\begin{aligned}\text{Net PVB}_{65} &= 910,223 - 150,000 \text{ CSV} \\ &= 760,223\end{aligned}$$

$$\begin{aligned}\text{PVB at 35} &= 760,223(D_{65} / D_{35}) \\ &= 760,223(v^{30}) && \text{(no pre-retirement decrements)} \\ &= 760,223(1.07)^{-30} \\ &= 99,868\end{aligned}$$

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$$\begin{aligned}\text{PVNC} &= \text{PVB} - \text{AAV} \\ &= 99,868 - 50,000 \\ &= 49,868\end{aligned}$$

You must determine the average temporary annuity to use in the normal cost calculation. Since you are told the cost method is based on level dollar funding, the weighted average is based on the number of participants. With only one participant, the average annuity equals their temporary annuity:

$$\begin{aligned}\text{Avg annuity} &= \ddot{a}_{\overline{35:30}|} \\ &= \ddot{a}_{\overline{30}|.07} \quad (\text{no pre-retirement decrements}) \\ &= 13.2777\end{aligned}$$

$$\begin{aligned}\text{Side fund NC} &= \text{PVNC} / \ddot{a}_{\overline{35:30}|} \\ &= 49,868 / 13.2777 \\ &= 3,756\end{aligned}$$

Answer is A

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Problem 24 – Page 1

The key to this problem is knowing the gain / loss formulas. In addition, you must be able to derive several annuity values that are not given in the problem.

$$\begin{aligned}\text{Non-inv G/L} &= {}_eAL_1 - AL_1 \\ {}_eAL_1 &= (1+i)(AL_0 + NC_0) - (\text{actual benefit payments} + i)\end{aligned}$$

Since these participants are retired, their NC is zero, and their AL is the same as their PVB. The easy part is calculating the PVB at 01/01/05:

Group	Participant and spouse Survived	Participant ONLY Survived	Spouse ONLY Survived	Total
Life count	85	2	3	
01/01/05 Age	66	66	N/A	
Spouse's Age	63	N/A	63	
Benefit	10,000	10,000	N/A	
Spouse's Benefit	5,000	N/A	5,000	
Payment form	50% J&S	Life annuity	Life annuity	
Annuity factor	$8.50 + 50\%(9.10 - 7.30)$ $= 9.40$	8.50	9.10	
01/01/05 AL	$9.40(850,000)$ $= 7,990,000$	$8.50(20,000)$ $= 170,000$	$9.10(15,000)$ $= 136,500$	8,296,500

Now you need to go back to 01/01/04 to calculate the accrued liability values for the entire group of 100 retirees:

$$\begin{aligned}{}_eAL_1 &= (1+i)(AL_0 + NC_0) - (\text{actual benefit payments} + i) \\ &= (1.07)(AL_0 - 10,000)\end{aligned}$$

$$AL_0 = 100(10,000)\{ \ddot{a}_{65} + (50\%)[\ddot{a}_{62} - \ddot{a}_{65:62}] \}$$

You need to derive the missing annuity values based on these identities:

$${}_v p_X \ddot{a}_{X+1} = \ddot{a}_X - 1.0$$

$$\ddot{a}_X = {}_v p_X \ddot{a}_{X+1} + 1.0$$

$$\ddot{a}_{62} = {}_v p_{62} \ddot{a}_{63} + 1.0$$

$$\ddot{a}_{62} = (.99/1.07)(9.10) + 1.0$$

$$\ddot{a}_{62} = 9.4196$$

$$\ddot{a}_{65} = {}_v p_{65} \ddot{a}_{66} + 1.0$$

$$\ddot{a}_{65} = (.98/1.07)(8.50) + 1.0$$

$$\ddot{a}_{65} = 8.7850$$

$${}_v p_X \ddot{a}_{X+1:Y+1} = \ddot{a}_{XY} - 1.0$$

$$\ddot{a}_{XY} = {}_v p_X \ddot{a}_{X+1:Y+1} + 1.0$$

$$\ddot{a}_{65:62} = {}_v p_{65:62} \ddot{a}_{66:63} + 1.0$$

$$\ddot{a}_{65:62} = (.99 * .98/1.07)(7.30) + 1.0$$

$$\ddot{a}_{65:62} = 7.6191$$

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Problem 24 – Page 2

$$\begin{aligned}AL_0 &= 100(10,000)\{8.7850 + (50\%)[9.4196 - 7.6191]\} \\ &= 9,685,299\end{aligned}$$

$$\begin{aligned}{}_eAL_1 &= (1+i)(AL_0 + NC_0) - (\text{actual benefit payments} + i) \\ &= (1.07)(AL_0 - 100(10,000)) \\ &= 9,293,270\end{aligned}$$

$$\begin{aligned}\text{Gain} &= 9,293,270 - 8,296,500 \\ &= 996,770\end{aligned}$$

Answer is D

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Problem 25 – Page 1

Similar to 2003 #25

The key to this problem is carefully handling the salary scale, and calculating the normal cost under the Aggregate method. Under the Aggregate method, the present value of normal costs (PVNC) is defined as the present value of benefits less the assets less the outstanding §412 bases (reduced by the credit balance).

The Aggregate normal cost is calculated by dividing the PVNC by the average temporary annuity from current age to the assumed retirement age. In this problem, the plan benefit is based on pay, so the temporary annuity will include the salary scale.

<u>Description</u>	<u>Calculation</u>
01/2005 Age	50
Past service	5
Total service	20
2004 pay (Age 49)	100,000
Age 64 pay	$100,000(1.03)^{15}$ $= 155,797$
Projected benefit	$20(1.5\%)(155,797)$ $= 46,739$
PV future benefits	$46,739(D_{65} / D_{50}) \ddot{a}_{65}^{(12)}$ $46,739(1.07)^{-15} (10.0)$ $= 169,404$

Now you can calculate the Aggregate PVNC:

$$\begin{aligned}\$412 \text{ PVNC} &= \text{PVB} - \text{AAV} - (\text{O/S } \$412 \text{ bases} - \text{CB}) && \text{NOTE: No ARA under Aggregate} \\ &= 169,404 - 62,000 - (0 - 0) \\ &= 107,404\end{aligned}$$

Now you need to calculate the average pay weighted annuity, which can then be used to calculate the normal cost. The temporary annuity with salary scale looks like this:

$$s\ddot{a}_{\overline{50:15}|} = 1 + (1.03/1.07)^1 + \dots + (1.03/1.07)^{14}$$

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Problem 25 – Page 2

You can simplify this to a certain annuity at a single interest rate:

$$\begin{aligned} {}^{s}\ddot{a}_{50:15} &= \ddot{a}_{15|j} \text{ where } 1+j = (1.07 / 1.03), \quad j = 3.88\% \\ &= 11.6448 \end{aligned}$$

In general, you calculate the average pay weighted annuity by dividing the present value of earnings by the total earnings. Since you only have one participant, the average temporary annuity (PVE/E) is equal to Smith's temporary annuity of 11.6448.

$$\begin{aligned} \$412 \text{ NC} &= \text{PVNC} / (\text{PVE}/\text{E}) \\ &= 107,404 / 11.6448 \\ &= 9,223 \end{aligned}$$

The main point of this problem is that you should not calculate the 12/31 minimum contribution yet. The reason is that you have enough information to calculate the Full Funding Limitation (FFL).

Since this plan uses an aggregate type cost method, the ERISA FFL must be calculated using the entry age normal cost and accrued liability. You have to do a separate Entry Age Normal valuation to generate the ERISA FFL.

In general, the Entry Age Normal Cost (EANC) is defined as the present value of benefits at entry age, divided by a temporary annuity at entry age. If the benefit is defined based on pay, the EANC is calculated as a level percentage of salary, and the temporary annuity will include a salary scale.

The plan formula accrues benefits for all years of service, so you use the participant's age at hire as EA in these formulas:

$$\text{Level \% EANC: } \text{PVB}_{\text{EA}} / {}^{s}\ddot{a}_{\text{EA:RA-EA}} \quad \text{at entry age - adjust later ages by salary scale}$$

Age 50 at 01/01/05
Entry age 45

Projected benefit 46,739 (previously calculated for Aggregate)

$$\begin{aligned} \text{PVB at 45} &= 46,739(D_{65} / D_{45}) \ddot{a}_{65}^{(12)} \\ &= 169,404 (1.07)^{-5} \\ &= 120,783 \end{aligned}$$

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Problem 25 – Page 3

Revised 09/08/07

The next step is calculation of the EA normal cost and accrued liability.

Level % EANC: $PVB_{EA} / \ddot{s}_{45:20}$ EANC at entry age - adjust later ages by salary scale

$$\begin{aligned}\ddot{s}_{45:20} &= \ddot{a}_{20|j} \quad \text{where } 1+j = (1.07 / 1.03), \quad j = 3.88\% \\ &= 14.2649\end{aligned}$$

$$\begin{aligned}EANC_{45} &= 120,783 / 14.2649 \\ &= 8,467\end{aligned}$$

$$\begin{aligned}EANC_{50} &= 8,467 * (1.03)^5 \\ &= 9,816\end{aligned}$$

Next, you can use the typical prospective formula for the accrued liability:

$$EAN AL = PVB - PV(EANC)$$

$$\begin{aligned}PV(EANC) &= EANC_{50}(\ddot{s}_{50:15}) \\ &= 9,816(11.6448) \quad (\text{previously calculated for Aggregate}) \\ &= 114,303\end{aligned}$$

$$\begin{aligned}EAN AL &= 169,404 - 114,303 \\ &= 55,101\end{aligned}$$

Finally, you have enough information to calculate the FFL. Since you have no current liability value, you should ignore the RPA FFL:

$$\begin{aligned}\S 412 \text{ "ERISA" FFL} &= (1+i)*(EANC + EAN AL) - (1+i)*[\text{lesser}(MVA, AAV) - CB] \\ &= 1.07 * (9,816 + 55,101 - (62,000 - 0)) \\ &= 3,121\end{aligned}$$

You do not need to complete the MFSA for 2005. Since the normal cost exceeds the FFL, there will be a FFL credit in the MFSA. Since the credit balance is zero, the 12/31/05 minimum contribution will equal the FFL of 3,121.

Answer is A

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Problem 25 – Page 4

In case you are not convinced, here are the details of the MFSA. The §412 FFL credit is defined as the excess of the Accumulated funding deficiency (AFD) based on zero contribution and zero credit balance over the FFL.

Under the Aggregate method, there are usually no charges except the normal cost. The AFD is 9,869, which equals 1.07 times the Aggregate normal cost. Since this exceeds the FFL of 3,121, there is a FFL credit in the MFSA for the excess of 6,748.

2005 Minimum Funding Standard Account			
Charges		Credits	
Normal Cost	9,223	Credit Balance	0
		12/31/ FFL credit	6,748
		12/31 minimum	x
7% interest	646	7% interest	0
Total charges	<u>9,869</u>	Total credits	<u>x + 6,748</u>

The minimum contribution payable 12/31/05 is $3,121 = 9,869 - 6,748$.

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Problem 26 – Page 1

Similar to 2001 #27

A key point of this problem is that you can use any credit balance at 12/31/04 to meet the quarterly contribution requirement for 2005. You need to calculate the credit balance at 12/31/04, which will allow you to determine the contribution that must be paid at 07/15/2005.

This problem is different from earlier ones on quarterly contributions. It is a longer problem, since you have to do individual participant calculations for both 2003 and 2005.

You can use the actuarial equation of balance to derive the amount of the credit balance. Since there have been no gains or losses, the only 412 amortization base is the 2003 initial accrued liability (IAL):

$$\begin{aligned} 01/01/05 \text{ UAL} &= \text{O/S } \$412 \text{ bases} - \text{CB} - \text{ARA} \\ &= \text{IAL}(\ddot{a}_{\overline{28}|.07} / \ddot{a}_{\overline{30}|.07}) - \text{CB} - \text{zero} \end{aligned}$$

Based on the default exam conditions, there are no pre-retirement decrements. This simplifies the calculations a bit:

01/01/2003 Valuation

Description

Birth Date	01/01/55
01/2003 Age	48

Hire Date	01/01/93
Past service	10
Future service	17

Accrued benefit	$12(100)(10)$ $= 12,000$
-----------------	-----------------------------

PV accrued benefit	$12,000(D_{65} / D_{48}) \ddot{a}_{65}^{(12)}$
UC accrued liability	$12,000(1.07)^{-17} (10.0)$
IAL	$= 37,989$

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Problem 26 – Page 2

01/01/2005 Valuation

Description

Birth Date 01/01/55
01/2005 Age 50

Hire Date 01/01/93
Past service 12
Future service 15

Accrued benefit $12(100)(12)$
 $= 14,400$

PV accrued benefit $14,400(D_{65} / D_{50}) \ddot{a}_{65}^{(12)}$
UC accrued liability $14,400(1.07)^{-15} (10.0)$
 $= 37,989(12/10)(1.07)^2$
 $= 52,192$

01/01/05 UAL = O/S §412 bases - CB - ARA

$52,192 - 17,560 = 37,989(\ddot{a}_{28|.07} / \ddot{a}_{30|.07}) - CB$
 $34,632 = 37,989(12.9867/13.2777) - CB$
 $CB = 37,156 - 34,632$
 $= 2,524$

You need to derive values for both the 2004 and 2005 normal costs. Since the cost method is Unit Credit, and the benefit accrues uniformly for all years of services, there is a simple relationship between the normal cost and the accrued liability:

2005 NC = 2005 AL / (01/01/05 past service)
 $= 52,192 / 12.0$
 $= 4,349$

You can also calculate the 2005 NC by writing down the expected value from 2004:

01/01/05 NC	$= {}_eNC_1$	(no gains or losses)
${}_eNC_1$	$= (1+i)^*(2004\ NC)$	(no pre-retirement decrements)
4,349	$= 1.07(2004\ NC)$	
2004 NC	$= 4,065$	

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Problem 26 – Page 3

With a UAL of 34,000, it should be clear that the Full Funding Limitation will have no effect. To calculate the required quarterly contribution for 2005, you must first calculate the required annual payment (RAP). This is the lesser of last year's minimum required contribution or 90% of this year's.

These numbers are both interest adjusted to the first day of the 2005 plan year, and they both would not reflect any credit balance. The only amortization will be for the 2003 IAL:

$$\begin{aligned}\text{IAL amort} &= 37,989 / \ddot{a}_{\overline{30}|.07} \\ &= 2,861\end{aligned}$$

$$\begin{aligned}12/31/04 \text{ "MFSA excluding CB"} &= (4,065 \text{ NC} + 2,861) * 1.07 &= 7,411 \\ 01/01/05 \text{ "MFSA excluding CB"} &= (4,349 \text{ NC} + 2,861) &= 7,210\end{aligned}$$

$$\text{Lesser of 2004 or 90\% of 2005} = \text{Lesser of } (7,411 \text{ or } .90 * 7,210) = 6,489$$

The required quarterly installment is based on the applicable percentage multiplied by the RAP, which is $25\%(6,489) = 1,622$.

You may use the 12/31/04 credit balance like an employer contribution for a required quarterly installment, but only if the contribution that creates the credit balance is actually in the trust fund at the installment date.

The problem states that the 2004 contribution was paid by 12/31/04, so you can apply the credit balance towards the 04/15/05 required quarterly installment. You could use the credit balance in exactly the same manner, even if the contribution was paid at 04/15/05.

Date	Required	Amount Available	Overpayment (Underpayment)
01/01/05		2,524	2,524
04/15/05	1,622	$2,524 * [1 + (.07)*(3.5/12)]$ = 2,576	$2,576 - 1,622$ = 953
07/15/05	1,622	$953 * [1 + (.07)*(3.5/12)]$ = 970	$970 - 1,622$ = (652)

The final underpayment at 07/15/05 represents the amount the employer must contribute at that date to avoid any late quarterly contribution penalty.

Answer is B

If you use compound interest, the final payment required at 07/15/05 is 654. As expected, this result is in the same answer range.

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Problem 27 – Page 1

Similar to 2004#19

The key to this problem is remembering to calculate the gain / loss for 2004. This is primarily a problem on the MFSA, with a bit of deductible limit calculations.

The deductible limit is the normal cost plus limit adjustments brought forward with interest to the earlier of the end of the plan year, or the end of the tax year.

$$\begin{aligned}\text{Deductible lim} &= 1.07(\text{NC} + \text{LA}) \\ &= (1.07)(\text{NC} + (\text{IAL} + \text{Loss}) / \ddot{a}_{10|.07})\end{aligned}$$

You must determine the expected and actual UAL at 01/01/05. The difference between those two values is the experience gain or loss base.

$$\text{Total G/L} = {}_e\text{UAL}_1 - \text{UAL}_1$$

$$01/01/05 \text{ } {}_e\text{UAL} = (1+i) * (\text{NC}_0 + \text{UAL}_0) - (\text{contribution} + \text{interest})$$

In order to calculate the expected UAL, you must first calculate the 2004 deductible limit:

$$\begin{aligned}\text{2004 Ded limit} &= (1.07)(\text{NC} + \text{IAL} / \ddot{a}_{10|.07}) \\ &= 1.07(50,000 + 345,000 / \ddot{a}_{10|.07}) \\ &= 102,620\end{aligned}$$

$$\begin{aligned}01/01/05 \text{ } {}_e\text{UAL} &= 1.07 * (50,000 + 345,000) - (1.035)(102,620) && \text{(simple interest)} \\ &= 316,438\end{aligned}$$

$$\begin{aligned}\text{Total G/L} &= 316,438 - 265,000 \\ \text{Gain base} &= 51,438\end{aligned}$$

$$\begin{aligned}\text{Gain amort} &= 51,438 \div \ddot{a}_{5|.07} \\ &= 11,725\end{aligned}$$

You also need to determine the credit balance at 12/31/04. First, calculate the MFSA amortization for the IAL:

$$\begin{aligned}\text{IAL amort} &= 345,000 \div \ddot{a}_{30|.07} \\ &= 25,983\end{aligned}$$

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Problem 27 – Page 2

Now you can set up the MFSA and calculate the 12/31/04 credit balance:

2004 Minimum Funding Standard Account			
Charges		Credits	
Normal Cost	50,000	Credit Balance	0
IAL amortization	25,983		
		07/01/04 contribution	102,620
7% interest	5,319	7% interest	3,592
Total charges	81,302	Total credits	106,212

Since this is a brand new plan at 01/01/04, you can ignore the FFL calculations. It would be VERY unusual for it to affect the minimum contribution calculation.

The interest on the mid-year contribution is calculated using simple interest. The credit balance at 12/31/04 is $24,910 = 106,212 - 81,302$.

Now you can set up the MFSA and calculate the 12/31/05 minimum contribution:

2005 Minimum Funding Standard Account			
Charges		Credits	
Normal Cost	50,000	Credit Balance	24,910
IAL amortization	25,983	Gain amortization	11,725
		12/31/05 minimum	x
7% interest	5,319	7% interest	2,564
Total charges	81,302	Total credits	x + 39,199

Since this is almost a brand new plan, you can ignore the FFL calculations. It would be VERY unusual for it to affect the minimum contribution calculation. The minimum contribution at 12/31/05 is $81,302 = 39,199 - 42,104$.

Answer is B

You could have worked the problem with compound interest:

2004 MFSA interest	=	3,531
12/31/04 MFSA CB	=	24,849
2005 $eUAl_1$	=	316,499
2005 Gain base	=	51,499
Gain amortization	=	11,738
2005 MFSA interest	=	2,561
12/31/05 minimum	=	42,154

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Problem 28 – Page 1

One key to this problem is knowledge of the gain / loss formulas. The total gain / loss is defined as the difference between the expected and actual unfunded accrued liability. The non-investment gain / loss is defined as the difference between the expected and actual accrued liability.

The investment gain / loss is defined as the difference between the expected and actual actuarial value of assets:

$$\text{Inv G/L} = {}_e\text{AAV}_1 - \text{AAV}_1$$

You can't directly calculate the asset G/L, since you don't know the value of the assets at 01/01/05. You can use the information given about the 2005 minimum contribution to determine the amount of the total G/L.

After you calculate the amount of the non-investment G/L for 2005, you can then back into the asset G/L.

$$\text{Total G/L} = \text{Non-inv G/L} + \text{Asset G/L}$$

$$\text{Asset G/L} = \text{Total G/L} - \text{Non-inv G/L}$$

$$\text{Non-inv G/L} = {}_e\text{AL}_1 - \text{AL}_1$$

$$\begin{aligned} {}_e\text{AL}_1 &= (1+i) * (\text{NC}_0 + \text{AL}_0) - (\text{benefit payments} + \text{interest}) \\ &= 1.07 * (60,000 + 400,000) - 0 \\ &= 492,200 \end{aligned}$$

$$\text{Non-inv G/L} = 492,200 - 460,000$$

$$\text{Gain} = 32,200$$

$$01/05 \text{ Min} = \text{NC} + 412 \text{ amortizations} - \text{CB}$$

$$70,000 = 60,000 + 400,000 / \ddot{a}_{30|.07} - (\text{Total Gain}) / \ddot{a}_{5|.07} - \text{CB}$$

$$\text{CB} = 60,000 + 30,126 - (\text{Total Gain}) / \ddot{a}_{5|.07} - 70,000$$

Now you can set up the MFSA and calculate the 12/31/04 credit balance:

2004 Minimum Funding Standard Account			
Charges		Credits	
Normal Cost	60,000	Credit Balance	0
IAL amortization	30,126		
		01/01/04 contribution	100,000
7% interest	6,309	7% interest	7,000
Total charges	96,435	Total credits	107,000

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Problem 28 – Page 2

Since this is a brand new plan at 01/01/04, you can ignore the FFL calculations. It would be VERY unusual for it to affect the minimum contribution calculation.

The credit balance at 12/31/04 is $10,565 = 107,000 - 96,435$. Now you can determine the total amount of the 2004 gain, and solve for the asset gain:

$$\begin{aligned} 01/05 \text{ Min} &= \text{NC} + 412 \text{ amortizations} - \text{CB} \\ \text{CB} &= 60,000 + 30,126 - (\text{Total Gain}) / \ddot{s}_{\overline{5}|.07} - 70,000 \\ 10,565 &= 60,000 + 30,126 - (\text{Total Gain}) / 4.3872 - 70,000 \\ \text{Total Gain} &= 9,561 * 4.3872 \\ &= 41,944 \\ \\ \text{Asset Gain} &= \text{Total Gain} - \text{Non-inv Gain} \\ &= 41,944 - 32,200 \\ &= 9,744 \end{aligned}$$

Answer is A

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Problem 29 – Page 1

Similar to 2004 #30

The key to this problem is carefully doing the 01/01/2004 valuation based on the new asset valuation method. Another key is knowing the rules in Revenue Procedure 2000-40 for setting up a new amortization base when there is a change in cost method.

Section 5.01(1) specifies that certain bases must be maintained regardless of the funding method that is used. These bases include waivers, shortfall gains and losses, and switchback from the AMFSA.

In general, the calculation of the normal cost must satisfy the formulas that are applicable to all reasonable funding methods (see the regulations at §1.412(c)(3)-1):

$$\begin{aligned} \text{PV Future Normal costs} &= \text{PV Future Benefits} - \text{Actuarial Assets} \\ &\quad - (\text{O/S §412 amortization bases} - \text{credit balance} - \text{ARA}) \end{aligned}$$

Except under the
Aggregate method

Section 5.01(2) requires that you set up a new method change base such that the $\text{UAL} = \text{O/S §412 bases} - \text{credit balance} - \text{ARA}$. If you change to a method other than Aggregate, then you must determine the method change base so that the equation of balance is satisfied.

You are told that the new asset valuation method uses 50% of market value and 50% of book value:

$$\begin{aligned} \text{new AAV} &= 425,000 \times .50 + 640,000 \times .50 \\ &= 532,500 \end{aligned}$$

The problem tells you that the AAV must be limited to be within 20% of market value. You should always do this, even if it is not stated in the problem:

$$\begin{aligned} \text{AAV limits} &= 425,000 \times .80 < \text{AAV} < 425,000 \times 1.20 \\ &= 340,000 < \text{AAV} < 510,000 \end{aligned}$$

$$\text{new AAV} = 510,000 \text{ (limited)}$$

The old AAV equals the market value of 425,000. The effect of the change in asset valuation method is an increase in the AAV of 85,000.

Under the Frozen Initial Liability method, the UAL must be adjusted for plan changes, assumption changes, and cost method changes. The asset valuation method change results in a decrease of 85,000 in the UAL.

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You need to use the actuarial equation of balance to solve for the UAL at 12/31/04, before the change in asset valuation method. At 01/01/05, there are 20 years left in the amortization of the IAL:

$$\begin{aligned} 12/31/04 \text{ UAL} &= \text{O/S 412 bases} - \text{CB} - \text{ARA} \\ &= 400,000(\ddot{a}_{\overline{20}|.07} / \ddot{a}_{\overline{30}|.07}) - 45,000 - 0 \\ &= 30,126(\ddot{a}_{\overline{20}|.07}) - 40,000 - 0 \\ &= 296,493 \end{aligned}$$

You should save the 30 year amortization of the IAL for later use in the MFSA. Now you can calculate the adjusted FIL UAL, and the FIL normal cost:

$$\begin{aligned} \text{new FIL UAL} &= 296,493 - 85,000 \\ &= 211,493 \end{aligned}$$

$$\begin{aligned} \text{PVNC} &= \text{PVFB} - \text{AAV} - \text{UAL} \\ &= 2,000,000 - 510,000 - 211,493 \\ &= 1,278,507 \end{aligned}$$

$$\begin{aligned} \text{PVE/E} &= 4,200,000 / 600,000 \\ &= 7.00 \end{aligned}$$

$$\begin{aligned} \text{NC} &= 1,278,507 / 7.00 \\ &= 182,644 \end{aligned}$$

The deductible limit is the normal cost plus limit adjustments brought forward with interest to the earlier of the end of the plan year, or the end of the tax year.

$$\begin{aligned} \text{Deductible lim} &= (1.07)(\text{NC} + (\text{IAL} + \text{Method}) / \ddot{a}_{\overline{10}|.07}) \\ &= 1.07*[182,644 + (400,000 - 85,000) / 7.5152] \\ &= 240,278 \end{aligned}$$

Since you have no Entry Age Normal valuation results, you can ignore the FFL calculation. With a large credit balance, the 412 minimum will not increase the deductible limit any further.

Answer is C

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Problem 30 – Page 1

Similar to 2004 #15

The key to this problem is calculation of the required quarterly installment, and the amount of the underpayment. You have to know how to handle the 412(l) charges for 2004 and 2005.

To calculate the minimum required quarterly contribution for 2005, you must first calculate the required annual payment (RAP). This is the lesser of last year's minimum required contribution or 90% of this year's. These numbers are both interest adjusted to the first day of this plan year, and they both would not reflect any credit balance.

You are given components of the minimum contribution for 2005 and 2004, both as of the end of the plan year.

$$\begin{aligned} 12/31/04 \text{ "MFSA excl CB"} &= (\$412 \text{ NC} + \text{amort} - 0) * 1.07 + 412(l) + 412(m) \\ &= 95,000 + 12,000 + 4,300 &= 111,300 \end{aligned}$$

$$\begin{aligned} 01/01/05 \text{ "MFSA excl CB"} &= (\$412 \text{ NC} + \text{amort} - 0) + 412(l)/[1+i^{CL}] \\ &= 111,000/1.07 + 18,000/1.06 &= 120,719 \end{aligned}$$

$$\text{Lesser of 2004 or 90\% of 2005} = \text{Lesser of } (111,300 \text{ or } .90 * 120,719) = 108,648$$

The 2005 required quarterly installment is based on the applicable percentage multiplied by the RAP, which is $25\%(108,648) = 27,162$.

Answer is D

NOTES:

1. There seems to be a bit of confusion in the data given for 2004. The first item indicates the 95,000 excludes interest on the quarterly contributions paid. The last item is identified as "Interest on late quarterly contributions".

That makes no sense for two reasons - it must include interest on ALL the contributions paid, whether they were paid late or timely. Since the contribution was actually paid at 09/15/2005, there really is NO interest on any 2004 contributions. I think the third item must be the interest penalty on late quarterly contributions, since nothing is paid for the 2004 plan year prior to 09/15/2005.

2. If you do not include the 412(m) interest penalty on late quarterly contributions of 4,300 in the 2004 "MFSA excl CB", the RAP is 107,000. The resulting required quarterly installment is $25\%(107,000) = 26,750$, which is in the wrong answer range C.
3. You can make a small error, and still get the correct answer range. You might mistakenly discount everything back to 01/01/05 at the valuation rate of 7%. The resulting required quarterly installment is 27,126, which is still in answer range D.

(more on next page)

Problem 30 – Page 2

4. The calculation of the "MFSA excl CB" normally includes the 412(m) charge for the year. But you can't include the current year's 412(m) charge when you are determining the current year's "MFSA excl CB". The current year's 412(m) charge is not known until the current year contributions have been paid.

In this problem, the actuary is assuming payment of the 2004 contribution at 09/15/05 as part of the calculation of the 04/15/05 quarterly installment. This is used in calculating last year's "MFSA excl CB".

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Problem 31

The key to this problem is knowing the gain / loss formulas, and how to calculate the G/L due to salary increases. As in earlier problems, this one has a salary scale, and a cost method given as Unit Credit. The cost method is actually Projected Unit Credit, which affects the solution very little.

You are given the costs and liabilities based on incorrect pay values. You need to redetermine these values based on pay that is 6.0% higher. The increase in pay will produce an additional loss base in the minimum funding standard account.

Description	Old pay values	New pay values
PUC normal cost	52,500	$1.06 \times (52,500)$ = 55,650
Accrued Liability	$1,071,000 + 830,000$ = 1,901,000	$1,071,000 + 1.06 \times (830,000)$ = 1,950,800
Loss due to 6% pay increase		$.06 \times (830,000)$ = 49,800

$$\begin{aligned} \text{Loss amortization} &= 49,800 / \ddot{s}_{\overline{5}|.07} \\ &= 11,351 \end{aligned}$$

2005 Minimum Funding Standard Account

Charges		Credits	
Normal Cost	55,650	Credit Balance	50,000
Old amortization	107,100		
Loss amortization	11,351	12/31/04 contribution	x
7% interest	12,187	7% interest	3,500
Total charges	186,288	Total credits	x + 53,500

Since you have no asset values, you must ignore the §412 Full Funding Limitation. The minimum contribution at 12/31/05 is $186,288 - 53,500 = 132,788$.

Answer is C

How did we use the PUC cost method in the solution? We used the PUC cost method to write the formula for the normal cost and accrued liability. Both items are based on a projected FAE1 at 65. Assuming all participants are under age 65, a salary change of 6% produces a projected FAE1 at 65 that is increased by 6%.

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Problem 32 – Page 1

The key to this problem is knowing how to do calculations under the Entry Age Normal (EAN) method:

$$\text{Level \$ EANC: } PVB_{EA} / \ddot{a}_{\overline{EA:RA-EA}|}$$

In addition, you must know how to handle the retirement rates. In general, retirement decrements are always assumed to occur at the beginning of the year.

Description	<u>Smith</u>	<u>Jones</u>
Age	40	40
Past service	15	5
Entry age	25	35
Total service	40	30

One thing to be careful about is that there are two sets of calculations for Smith. Once Smith has 30 years of service (at age 55), then 50% of them is assumed to retire. The other 50% will retire at age 65, with 40 years of service.

It will be less confusing to do Jones' calculations first:

Jones - retirement at 65

$$\begin{aligned}\text{Proj Ben} &= 35(12)(30) \\ &= 12,600\end{aligned}$$

$$\begin{aligned}\text{PVB at 35} &= 12,600(D_{65} / D_{35}) \ddot{a}_{65}^{(12)} \\ &= 12,600(1.07)^{-30}(9.70)\end{aligned}$$

The next step is calculation of the EA normal cost and accrued liability.

$$\text{Level \$ EANC: } PVB_{35} / \ddot{a}_{\overline{35:30}|}$$

$$\begin{aligned}\text{EANC}_{35} &= PVB_{35} / \ddot{a}_{\overline{30|.07}|} \\ &= 12,600 (9.70) / \ddot{s}_{\overline{30|.07}|} \\ &= 122,220 / 101.0730 \\ &= 1,209.22\end{aligned}$$

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Next, you can use the typical retrospective formula for the accrued liability. You should calculate the accumulated value of the EANC with interest and survivorship, from entry age to current age:

$$\begin{aligned} \text{EAN AL} &= \text{EANC}(\ddot{s}_{40:5}) \\ &= 1,209.22 * \ddot{s}_{5|.07} \\ &= 7,441 \end{aligned}$$

Now you can do Smith's calculations - one for retirement at 55, and the other for retirement at 65:

Description	<u>Smith - retire at 55</u>	<u>Smith - retire at 65</u>
Entry age	25	25
Retirement age	55	65
Service at retirement	30	40
Projected benefit	$35(12)(30) = 12,600$	$35(12)(40) = 16,800$
Early retirement benefit	$100\%(12,600)$	$100\%(16,800)$
Probability of retirement	50%	50%
PVB at entry age for Retirement benefit	$50\%(12,600)(D_{55} / D_{25}) \ddot{a}_{65}^{(12)}$ $= .5(12,600)v^{30} \ddot{a}_{55}^{(12)}$ $= 6,300(.1314)(11.30)$ $= 9,352$	$50\%(16,800)(D_{65} / D_{25}) \ddot{a}_{65}^{(12)}$ $= .5(16,800)v^{40} \ddot{a}_{65}^{(12)}$ $= 8,400(.0668)(9.70)$ $= 5,441$
PVB at entry age for Retirement supplement	$50\%(500)(12)(D_{55} / D_{25}) \ddot{a}_{55:10}^{(12)}$ $= 3,000(.1314)(7.00)$ $= 2,759$	

Smith's total PVB at entry age is $17,552 = 9,352 + 5,441 + 2,759$. Now you must calculate the temporary annuity for Smith's normal cost:

$$\begin{aligned} \text{EANC}_{25} &= \text{PVB}_{25} / \ddot{a}_{25:40} \\ \ddot{a}_{25:40} &= \sum_{t=0}^{39} v^t p_{25}^{(T)} \\ &= 1 + v {}^1p_{25}^{(T)} + v^2 {}^2p_{25}^{(T)} + \dots + v^{29} {}^{29}p_{25}^{(T)} + v^{30} {}^{30}p_{25}^{(T)} + v^{31} {}^{31}p_{25}^{(T)} + \dots + v^{39} {}^{39}p_{25}^{(T)} \end{aligned}$$

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50% of Smith is assumed to retire at age 55:

$$\begin{aligned}\ddot{a}_{\overline{25:40}|} &= 1 + v^1 + v^2 + \dots + v^{29} + .50(v^{30} + v^{31} + \dots + v^{39}) \\ &= .50(1 + v^1 + v^2 + \dots + v^{29}) + .50(1 + v^1 + v^2 + \dots + v^{39}) \\ &= .50(\ddot{a}_{\overline{30|.07}|} + \ddot{a}_{\overline{40|.07}|}) \\ &= 13.7713\end{aligned}$$

$$\begin{aligned}\text{EANC}_{25} &= \text{PVB}_{25} / \ddot{a}_{\overline{25:40}|} \\ &= 17,552 / 13.7713 \\ &= 1,274.53\end{aligned}$$

$$\begin{aligned}\text{EAN AL} &= \text{EANC}(\ddot{s}_{\overline{40:15}|}) \\ &= 1,274.53 * \ddot{s}_{\overline{15|.07}|} \\ &= 34,270\end{aligned}$$

The total EAN AL is $34,270 + 7,441 = 41,710$.

Answer is B

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Problem 33 – Page 1

Similar to 2002 #16

The key to this problem is knowing the rules in Revenue Procedure 2000-40 for setting up a new amortization base when there is a change in cost method. Section 5.01(1) specifies that certain bases must be maintained regardless of the funding method that is used. These bases include waivers, shortfall gains and losses, and switchback from the AMFSA.

In general, the calculation of the normal cost must satisfy the formulas that are applicable to all reasonable funding methods (see the regulations at §1.412(c)(3)-1):

$$\begin{aligned} \text{PV Future Normal costs} &= \text{PV Future Benefits} - \text{Actuarial Assets} \\ &\quad - (\text{O/S §412 amortization bases} - \text{credit balance} - \text{ARA}) \end{aligned}$$

Except under the
Aggregate method

Section 5.01(2) requires that you set up a new method change base such that the $\text{UAL} = \text{O/S §412 bases} - \text{credit balance} - \text{ARA}$. If you change to a method other than Aggregate, then you must determine the method change base so that the equation of balance is satisfied.

$$\text{UC UAL} = \text{O/S §412 bases} + \text{Method base} - \text{CB} - \text{ARA}$$

One minor trick to this problem is that you need to determine the G/L base that was established at 01/01/2005. This base would be established when the new cost method is anything other than Individual Aggregate, or the Aggregate method (see section 5.01(2) of Revenue Procedure 2000-40).

In this problem, you are not given the actuarial value or market value of assets at 01/01/05. The only asset is the outstanding 2004 contribution of 145,000, which will be paid at 09/15/05.

One key point of the problem is that you should NOT use the discounted value of the outstanding contribution. By using the non-discounted contribution as the 01/01/05 AAV, it is likely there will be an asset loss at 01/01/06.

$$\begin{aligned} \text{UC UAL} &= \text{O/S §412 bases} + \text{G/L base} + \text{Method base} - \text{CB} - \text{ARA} \\ &= \text{UC AL} - \text{AAV} \\ &= 1,225,000 - 145,000 \\ &= 1,080,000 \end{aligned}$$

$$\begin{aligned} \text{Method chg base} &= 1,225,000 - 1,380,000 \\ &= -155,000 \end{aligned}$$

Since last year's cost method was EAN, the G/L calculations must be done using the EAN method:

$$\begin{aligned} \text{Total G/L} &= {}_e\text{UAL}_1 - \text{UAL}_1 && \text{(both under EAN)} \\ \text{EAN UAL} &= \text{EAN AL} - \text{AAV} \\ &= 1,380,000 - 145,000 \\ &= 1,235,000 \end{aligned}$$

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$$\begin{aligned} {}_e\text{UAL}_1 &= (1+i)(\text{NC}_0 + \text{UAL}_0) - (\text{contribution} + \text{interest}) \\ &= 1.07(39,000 + 1,200,000) - 145,000 \\ &= 1,180,730 \end{aligned}$$

$$\begin{aligned} \text{Total G/L} &= {}_e\text{UAL}_1 - \text{UAL}_1 && \text{(both under EAN)} \\ &= 1,180,730 - 1,235,000 \\ &= -54,270 && \rightarrow \text{Loss of 54,270} \end{aligned}$$

$$\begin{aligned} \text{UC UAL} &= \text{O/S } \$412 \text{ bases} + \text{G/L base} + \text{Method base} - \text{CB} - \text{ARA} \\ 1,080,000 &= 1,200,000(\ddot{a}_{\overline{29}|.07} / \ddot{a}_{\overline{30}|.07}) + 54,270 - 155,000 - \text{CB} - 0 \end{aligned}$$

$$\begin{aligned} \text{CB} &= 1,187,296 + 54,270 - 155,000 - 1,080,000 \\ &= 6,566 \end{aligned}$$

The amortization period for all cost method change amortization bases specified in Revenue Procedure 2000-40 is 10 years. You could have saved the value of the IAL amortization from the prior calculation of the O/S base:

$$\text{IAL amortization} = 1,200,000 / \ddot{a}_{\overline{30}|.07} = 90,377$$

$$\text{Method amortization} = -155,000 / \ddot{a}_{\overline{10}|.07} = -20,625$$

$$\text{Loss amortization} = 54,270 / \ddot{a}_{\overline{5}|.07} = 12,370$$

The final step is setting up the MFSA to calculate the minimum contribution:

2005 Minimum Funding Standard Account			
Charges		Credits	
Normal Cost	48,000	Credit Balance	6,566
IAL amortization	90,377	Method amortization	20,625
Loss amortization	12,370	12/31/05 minimum	x
7% interest	10,552	7% interest	1,903
Total charges	161,299	Total credits	x + 29,904

Based on the size of the UAL, the §412 Full Funding Limitation will have no effect. The minimum contribution at 12/31/05 is $132,205 = 161,299 - 29,904$.

Answer is C

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Problem 34

The key to this problem is knowing the rules in Revenue Procedure 2000-40 for changes in cost method due to a change in valuation software. This is the first in-depth question on this part of that revenue procedure.

I. TRUE

Under Section 4.04(6), you can only get automatic approval to for a change in the valuation software if you did not do this in the prior year.

II. FALSE

Under Section 4.04(5), it states the threshold for automatic approval is when the net charge to the MFSA does not change by more than 2%.

III. TRUE

See Section 4.04(8) of the procedure. The same rule (treating the change as an experience G/L) also applies for changes in the enrolled actuary.

Only I and III are true

Answer is B

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Problem 35 – Page 1

Similar to 1996 #32

In some §404 problems, the hardest thing to get straight is which valuation corresponds to which tax year. Usually you are only given one set of valuation results, which is based on the correct valuation date.

The deductible limit for the taxable year ending 6/30/05 is based on the valuation for the plan year beginning in that tax year. The 01/01/05 valuation should be used to determine the deductible limit needed for the answer to this problem.

The first step should be to calculate the normal cost plus limit adjustments. The ten year amortization bases include the initial accrued liability. The deductible limit is the normal cost plus limit adjustments brought forward with interest to the earlier of the end of the plan year, or the end of the tax year, which is 6/30/05.

Based on the information given in the problem, the 412 normal cost and PVNC both equal the 404 values. Based on the general exam conditions, you can assume that all prior contributions have been deducted, so the assets and unfunded accrued liability values are the same under both §404 and §412. Based on exam condition #27, the §412 values are given in exam problems.

In this problem, you are told that there was a 275,000 contribution for the tax year ending 06/30/2004, which was not deducted. In addition, the limit adjustment is zero.

$$\begin{aligned}\text{Deductible limit} &= (225,000 + 0) * [1 + (6/12) * .07] \\ &= 232,875\end{aligned}$$

The second step is usually to check the Full Funding Limitation under §404. The examples in Revenue Ruling 82-125 show how to calculate the Full Funding Limitation when you have a non-deductible contribution in the assets. The NDC should not get any interest credit:

$$\text{§404 AAV} = \text{AAV} - \text{NDC}$$

$$\begin{aligned}\text{§404 ERISA FFL} &= (1+i)(\text{NC}+\text{AL}) - (1+i)[\text{lesser of MV, AAV}] + \text{NDC} \\ &= 1.07(225,000 + 1,460,000) - 1.07(1,720,000) + 275,000 \\ &= -37,450 + 275,000 \\ &= 237,550\end{aligned}$$

The Full Funding Limitation does not reduce the previously calculated deductible limit. The third step would be to calculate the minimum contribution required under §412. With no credit balance you can't check the 412 minimum contribution.

You can't calculate the deductible limit based on unfunded current liability. The final deductible limit is 232,875.

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Problem 35 – Page 2

The potential deduction for 2005 is the sum of the cash contribution of 110,000 at 04/30/05, and the non-deducted contribution of 275,000, which equals 385,000.

Since this amount exceeds the deductible limit of 232,875, the amount of the non-deductible contribution for 2005 is $385,000 - 232,875 = 152,125$. This amount will be carried forward and deducted in a future tax year.

Answer is B

NOTE:

Using compound interest, the deductible limit is 232,742. This results in a carry forward (non-deductible) contribution of 152,258. As expected, this result is also in answer range B.

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Problem 36 – Page 1

Similar to 2002 #16

The key to this problem is knowing the rules in Revenue Procedure 2000-40 for setting up a new amortization base when there is a change in cost method. Section 5.01(1) specifies that certain bases must be maintained regardless of the funding method that is used. These bases include waivers, shortfall gains and losses, and switchback from the AMFSA.

In general, the calculation of the normal cost must satisfy the formulas that are applicable to all reasonable funding methods (see the regulations at §1.412(c)(3)-1):

$$\begin{aligned} \text{PV Future Normal costs} &= \text{PV Future Benefits} - \text{Actuarial Assets} \\ &\quad - (\text{O/S §412 amortization bases} - \text{credit balance} - \text{ARA}) \end{aligned}$$

Except under the
Aggregate method

Section 5.01(2) requires that you set up a new method change base such that the $\text{UAL} = \text{O/S §412 bases} - \text{credit balance} - \text{ARA}$. If you change to a method other than Aggregate, then you must determine the method change base so that the equation of balance is satisfied.

$$\text{UC UAL} = \text{O/S §412 bases} + \text{Method base} - \text{CB} - \text{ARA}$$

One minor trick to this problem is that you need to determine the G/L base that was established at 01/01/2005. This base would be established when the new cost method is anything other than Individual Aggregate, or the Aggregate method (see section 5.01(2) of Revenue Procedure 2000-40).

$$\text{UC UAL} = \text{O/S §412 bases} + \text{G/L base} + \text{Method base} - \text{CB} - \text{ARA}$$

$$\begin{aligned} \text{Method chg base} &= \text{UC AL} - \text{EAN AL} \\ &= 1,100,000 - 1,300,000 \\ &= -200,000 \end{aligned}$$

Since last year's cost method was EAN, the G/L calculations must be done using the EAN method:

$$\text{Total G/L} = {}_e\text{UAL}_1 - \text{UAL}_1 \quad (\text{both under EAN})$$

$$\begin{aligned} \text{EAN UAL} &= \text{EAN AL} - \text{AAV} \\ &= 1,300,000 - 600,000 \\ &= 700,000 \end{aligned}$$

Since you don't have the 2004 valuation results, you can't directly calculate the expected UAL. You will need to use the actuarial equation of balance:

$${}_e\text{UAL}_1 = \text{O/S §412 bases} - \text{CB} - \text{ARA} \quad (\text{excluding G/L base} + \text{Method base})$$

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Amortization base	Amortization payment	Remaining Years 01/01/05	Outstanding base at 01/01/05
1-1-1976 Initial AL	Assumed zero		
1-1-1999 Assm chg base	50,000	4 = 10-(2005-1999)	$181,216 = 50,000 * \ddot{a}_{\overline{4} .07}$
1-1-2001 Plan chg base	30,000	27 = 30-(2005-2001)	$379,607 = 30,000 * \ddot{a}_{\overline{26} .07}$
Total O/S bases			560,823

$$\begin{aligned} {}_e\text{UAL}_1 &= 560,823 - 40,000 - 0 \\ &= 520,823 \end{aligned}$$

$$\begin{aligned} \text{Total G/L} &= {}_e\text{UAL}_1 - \text{UAL}_1 && \text{(both under EAN)} \\ &= 520,823 - 700,000 \\ &= -179,177 && \rightarrow \text{Loss of 179,177} \end{aligned}$$

The amortization period for all cost method change amortization bases specified in Revenue Procedure 2000-40 is 10 years.

$$\text{Method amortization} = -200,000 / \ddot{a}_{\overline{10}|.07} = -26,613$$

$$\text{Loss amortization} = 179,177 / \ddot{a}_{\overline{5}|.07} = 40,841$$

The final step is setting up the MFSA to calculate the minimum contribution:

2005 Minimum Funding Standard Account			
Charges		Credits	
Normal Cost	87,000	Credit Balance	40,000
Assm chg amortization	50,000	Method amortization	26,613
Plan chg amortization	30,000		
Loss amortization	40,841	12/31/05 minimum	x
7% interest	14,549	7% interest	4,663
Total charges	222,390	Total credits	x + 71,276

Based on the size of the UAL, the §412 Full Funding Limitation will have no effect. The minimum contribution at 12/31/05 is $151,114 = 222,390 - 71,276$.

Answer is D

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Problem 37 – Page 1

Similar to 2002 #16

This problem is almost identical to the prior problem. The intent may have been to trick you into missing the multiemployer part of problem. The key differences are that the assumption change base is amortized over 30 years, and the loss base is amortized over 15 years.

The key to this problem is knowing the rules in Revenue Procedure 2000-40 for setting up a new amortization base when there is a change in cost method. Section 5.01(1) specifies that certain bases must be maintained regardless of the funding method that is used. These bases include waivers, shortfall gains and losses, and switchback from the AMFSA.

In general, the calculation of the normal cost must satisfy the formulas that are applicable to all reasonable funding methods (see the regulations at §1.412(c)(3)-1):

$$\text{PV Future Normal costs} = \text{PV Future Benefits} - \text{Actuarial Assets} \\ - (\text{O/S §412 amortization bases} - \text{credit balance} - \text{ARA})$$

Except under the
Aggregate method

Section 5.01(2) requires that you set up a new method change base such that the $\text{UAL} = \text{O/S §412 bases} - \text{credit balance} - \text{ARA}$. If you change to a method other than Aggregate, then you must determine the method change base so that the equation of balance is satisfied.

$$\text{UC UAL} = \text{O/S §412 bases} + \text{Method base} - \text{CB} - \text{ARA}$$

One minor trick to this problem is that you need to determine the G/L base that was established at 01/01/2005. This base would be established when the new cost method is anything other than Individual Aggregate, or the Aggregate method (see section 5.01(2) of Revenue Procedure 2000-40).

$$\text{UC UAL} = \text{O/S §412 bases} + \text{G/L base} + \text{Method base} - \text{CB} - \text{ARA}$$

$$\begin{aligned} \text{Method chg base} &= \text{UC AL} - \text{EAN AL} \\ &= \text{UC UAL} - \text{EAN UAL} \\ &= 650,000 - 1,000,000 \\ &= -350,000 \end{aligned}$$

Since last year's cost method was EAN, the G/L calculations must be done using the EAN method:

$$\text{Total G/L} = {}_e\text{UAL}_1 - \text{UAL}_1 \quad (\text{both under EAN})$$

Since you don't have the 2004 valuation results, you can't directly calculate the expected UAL. You will need to use the actuarial equation of balance:

$${}_e\text{UAL}_1 = \text{O/S §412 bases} - \text{CB} - \text{ARA} \quad (\text{excluding G/L base} + \text{Method base})$$

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Problem 37 – Page 2

Amortization base	Amortization payment	Remaining Years 01/01/05	Outstanding base at 01/01/05
1-1-1995 Initial AL	50,000	20 = 30-(2005-1995)	$566,780 = 50,000 * \ddot{a}_{\overline{20} .07}$
1-1-2000 Assm chg base	20,000	25 = 30-(2005-2000)	$249,387 = 20,000 * \ddot{a}_{\overline{25} .07}$
Total O/S bases			816,166

$$\begin{aligned} {}_e\text{UAL}_1 &= 816,166 - 40,000 - 0 \\ &= 776,166 \end{aligned}$$

$$\begin{aligned} \text{Total G/L} &= {}_e\text{UAL}_1 - \text{UAL}_1 && (\text{both under EAN}) \\ &= 776,166 - 1,000,000 \\ &= -223,834 && \rightarrow \text{Loss of 223,834} \end{aligned}$$

The amortization period for all cost method change amortization bases specified in Revenue Procedure 2000-40 is 10 years.

$$\text{Method amortization} = -350,000 / \ddot{a}_{\overline{10}|.07} = -46,572$$

$$\text{Loss amortization} = 223,834 / \ddot{a}_{\overline{15}|.07} = 22,968$$

The final step is setting up the MFSA to calculate the minimum contribution:

2005 Minimum Funding Standard Account			
Charges		Credits	
Normal Cost	80,000	Credit Balance	40,000
IAL amortization	50,000	Method amortization	46,572
Assm chg amortization	20,000		
Loss amortization	22,968	12/31/05 minimum	x
7% interest	12,108	7% interest	6,060
Total charges	185,076	Total credits	x + 92,632

Based on the size of the UAL, the §412 Full Funding Limitation will have no effect. The minimum contribution at 12/31/05 is $92,444 = 185,076 - 92,632$.

Answer is C

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Problem 38 – Page 1

Similar to EA-2 2000 #26

With an aggregate type cost method, you would need both the market value of assets, and EAN valuation results to check the Full Funding Limitation. You don't know enough about the benefit definition under the plan to calculate the EAN accrued liability and normal cost. As a result, you can't calculate the Full Funding Limitation.

01/01/2004 Valuation

You need to calculate the 2004 normal cost. Then you can derive the credit balance at 12/31/04:

Birth Date 01/01/54

01/2004 Age 50

AGG PVNC = PVB - AAV - (O/S §412 bases-CB+DB) NOTE: No ARA under Aggregate

$$\begin{aligned}\$412 \text{ PVNC} &= 350,000 - 0 - (0 - 0) \\ &= 350,000\end{aligned}$$

In general, you use the average temporary annuity in the Aggregate normal cost calculation. With a single participant, you only have to calculate one value:

$$\begin{aligned}\text{Avg annuity} &= \ddot{a}_{50:15} \\ &= \ddot{a}_{15|.07} && \text{(no pre-retirement decrements)} \\ &= 9.7455\end{aligned}$$

$$\begin{aligned}\text{AGG NC} &= 350,000 / 9.7455 \\ &= 35,914\end{aligned}$$

2004 Minimum Funding Standard Account

Charges		Credits	
Normal Cost	35,914	Credit Balance	0
		01/01/04 contribution	20,000
7% interest	2,514	7% interest	1,400
Total charges	<u>38,428</u>	Total credits	<u>21,400</u>

At 12/31/04 the deficiency is $38,428 - 21,400 = 17,028$. After the waiver of 10,000, the plan still has a debit balance of 7,028 at 01/01/05. This is typical for waiver problems on the exam.

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Problem 38 – Page 2

At 01/01/05, the new waiver base of 10,000 is established. Now you can calculate the 2005 normal cost:

01/01/2005 Valuation

Birth Date 01/01/54
01/2005 Age 51

One thing seems to be missing in this problem. The data does not state what the actuarial value of assets is at 01/01/2005. Based on the 20% rate of return, you can calculate the market value of assets. The only reasonable assumption is that the actuarial value should also equal the market value of assets.

$$\begin{aligned}\$412 \text{ MVA} &= 20,000 * 1.20 \\ \$412 \text{ AAV} &= 20,000 * 1.20\end{aligned}$$

$$\text{AGG PVNC} = \text{PVB} - \text{AAV} - (\text{O/S } \$412 \text{ bases} - \text{CB} + \text{DB}) \quad \text{NOTE: No ARA under Aggregate}$$

$$\begin{aligned}\$412 \text{ PVNC} &= 365,000 - 24,000 - (10,000 - 0 + 7,028) \\ &= 323,972\end{aligned}$$

In general, you use the average temporary annuity in the Aggregate normal cost calculation. With a single participant, you only have to calculate one value:

$$\begin{aligned}\text{Avg annuity} &= \ddot{a}_{51:14} \\ &= \ddot{a}_{14|.07} \quad \text{(no pre-retirement decrements)} \\ &= 9.7455\end{aligned}$$

$$\begin{aligned}\text{AGG NC} &= 323,972 / 9.3577 \\ &= 34,621\end{aligned}$$

Answer is A

NOTES:

1. This problem did not ask you to develop the minimum contribution. The waiver should be amortized at the greater of the valuation rate, or 150% of the Federal mid-term rate.
2. Normally you would calculate an end of year amortization payment for the waiver. This is only necessary when the waiver amortization rate is different than the valuation interest rate.

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Problem 39

This is a straightforward exam problem, as long as you know the amortization periods for the MFSA bases:

Amortization base	Outstanding base at 01/01/05	Remaining Years 01/01/05	Amortization payment
1-1-1996 Initial AL	Assumed zero		
1-1-1997 Assm chg base	40,000	2 = 10-(2005-1997)	$20,676 = 40,000 / \ddot{a}_{2 .07}$
1-1-2003 Method chg base	100,000	8 = 10-(2005-2003)	$15,651 = 100,000 / \ddot{a}_{8 .07}$
1-1-2005 Loss base	50,000	5	$11,397 = 50,000 / \ddot{a}_{5 .07}$

The final step is setting up the MFSA to calculate the minimum contribution:

2005 Minimum Funding Standard Account

Charges		Credits	
Normal Cost	25,000	Credit Balance	5,000
Assm chg amortization	20,676		
Method chg amortization	15,651	12/31/05 minimum	x
Loss amortization	11,397		
7% interest	5,091	7% interest	350
Total charges	77,815	Total credits	x + 5,350

You have no asset values, so you must ignore the §412 Full Funding Limitation. The minimum contribution at 12/31/05 is $72,465 = 77,815 - 5,350$.

Answer is D

NOTE:

The only confusing part is that the IAL base is apparently zero. This could occur if the original cost method was Aggregate, Individual Aggregate, or Individual Level Premium. This could also occur if the plan did not grant past service credit for benefit accrual before the effective date.

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Problem 40 – Page 1

This is a straightforward exam problem, as long as you know the basic definitions of the 412 minimum contribution calculation, and the various funding methods.

X - Aggregate method

For item X, there is no UAL. All liabilities are funded through the normal cost. The participant is current age 31, and there are no pre-retirement decrements by default:

$$\begin{aligned}\text{AGG NC} &= (\text{PVB}_{\text{CA}} - \text{AAV}) / \ddot{a}_{\overline{\text{CA:RA-CA}}|} \\ &= \text{PVB} / \ddot{a}_{\overline{\text{CA:RA-CA}}|} \\ \text{X} &= 1.07 * (\text{PVB} / \ddot{a}_{\overline{34|.07}})\end{aligned}$$

Y - Entry Age Normal method

The key to working this problem quickly is realizing that the value of Y is identical under the Entry Age Normal method and the Frozen Initial Liability method. For this to be true, you must meet these conditions:

- This must be the first year the IAL is established, and
- You must calculate the normal cost as a level dollar amount, and
- Each participant must have the same temporary annuity to assumed retirement age.

For item Y, the IAL is defined based on the Entry Age Normal method. The initial accrued liability is amortized over 30 years, and the remaining liability is funded through the normal cost:

$$\begin{aligned}\text{FIL NC} &= (\text{PVB}_{\text{CA}} - \text{UAL} - \text{AAV}) / \ddot{a}_{\overline{\text{CA:RA-CA}}|} \\ &= (\text{PVB} - \text{EAN AL}) / \ddot{a}_{\overline{\text{CA:RA-CA}}|} \\ \text{Y} &= 1.07 * [(\text{PVB} - \text{EAN AL}) / \ddot{a}_{\overline{34|.07}} + (\text{EAN AL}) / \ddot{a}_{\overline{30|.07}}]\end{aligned}$$

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Problem 40 – Page 2

Z - Attained Age Normal method

For item Z, the IAL is defined based on the Unit Credit method. The initial accrued liability is amortized over 30 years, and the remaining liability is funded through the normal cost:

$$\begin{aligned} \text{AAN NC} &= (\text{PVB}_{\text{CA}} - \text{UAL} - \text{AAV}) / \ddot{a}_{\overline{\text{CA:RA-CA}}|} \\ &= (\text{PVB} - \text{UC AL}) / \ddot{a}_{\overline{\text{CA:RA-CA}}|} \\ \text{Y} &= 1.07 * [(\text{PVB} - \text{UC AL}) / \ddot{a}_{\overline{34}|.07} + (\text{UC AL}) / \ddot{a}_{\overline{30}|.07}] \end{aligned}$$

Now that you have the expressions for X, Y and Z, how do they rank in terms of magnitude? It should be clear that Y and Z are larger than X. The same amount of liability is being funded for all three methods, but it is spread over a longer time period for X.

To compare Y and Z, you must know something about the EAN and Unit Credit accrued liabilities. For a fairly young participant, the EAN accrued liability must be larger than under Unit Credit. The reason is that you have a level normal cost under EAN, but an increasing normal cost under Unit Credit.

Since the EAN accrued liability is larger, that means that Y is greater than Z. So the final ranking is $Y > Z > X$.

Answer is B

NOTES:

1. You can calculate numeric values for each of X, Y and Z. But that might take a bit too long for a 3 point question.
2. If you do the calculations, you can verify that the normal cost under EAN and FIL both equal 1,428.

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Problem 41 – Page 1

Similar to 2004#19

The key to this problem is handling the accumulated reconciliation account correctly in the calculation of the gain / loss for 2004. This is primarily a problem on the MFSA, with a bit of deductible limit calculations.

The deductible limit is the normal cost plus limit adjustments brought forward with interest to the earlier of the end of the plan year, or the end of the tax year.

$$\begin{aligned}\text{Deductible lim} &= 1.07(\text{NC} + \text{LA}) \\ &= (1.07)(\text{NC} + (\text{IAL} + \text{Loss}) / \ddot{a}_{\overline{10}|.07})\end{aligned}$$

You must determine the expected and actual UAL at 01/01/05. The difference between those two values is the experience gain or loss base.

$$\text{Total G/L} = {}_e\text{UAL}_1 - \text{UAL}_1$$

$$01/01/05 {}_e\text{UAL} = (1+i)^*(\text{NC}_0 + \text{UAL}_0) - (\text{contribution} + \text{interest})$$

Since you don't have the 2004 valuation results, you can't directly calculate the expected UAL. You will need to use the actuarial equation of balance:

$$\begin{aligned}{}_e\text{UAL}_1 &= \text{O/S } \$412 \text{ bases} - \text{CB} - \text{ARA} && \text{(excluding G/L base)} \\ &= 400,000(\ddot{a}_{\overline{26}|.07} / \ddot{a}_{\overline{30}|.07}) - 12,000 - 40,000 \\ &= 30,126 * \ddot{a}_{\overline{26}|.07} - 12,000 - 40,000 \\ &= 329,199\end{aligned}$$

When you calculate the annual amortization amount for the IAL base, you should save that value. You may need it later for use in the MFSA.

$$\begin{aligned}01/01/05 \text{ UAL} &= 2,200,000 - 1,800,000 \\ &= 400,000\end{aligned}$$

$$\begin{aligned}\text{Total G/L} &= 400,000 - 329,199 \\ \text{Loss base} &= 70,801\end{aligned}$$

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Problem 41 – Page 2

Now you can calculate the 2005 deductible limit:

$$\begin{aligned}\text{2005 Ded limit} &= (1.07)(\text{NC} + (\text{IAL} + \text{Loss}) / \ddot{a}_{10|.07}) \\ &= 1.07(65,000 + (400,000 + 70,801) / \ddot{a}_{10|.07}) \\ &= 136,582\end{aligned}$$

The next step is to check the Full Funding Limitation under §404:

$$\begin{aligned}\text{\$404 "ERISA" FFL} &= (1+i) * (\text{NC} + \text{AL} - (\text{lesser MVA, AAV})) \\ &= 1.07 * (65,000 + 2,200,000 - 1,800,000)\end{aligned}$$

With no current liability values, you must ignore the 404 RPA FFL. It is clear that the 404 FFL will not reduce the deductible limit below 136,582.

Since the §404 FFL does not apply, you need to at least think about calculating the §412 minimum contribution. With a loss base, it is possible that the minimum could exceed the normal cost plus limit adjustments. The reason is that the loss is amortized over five years versus ten years for the deductible limit.

$$\begin{aligned}\text{Loss amort} &= 70,801 \div \ddot{a}_{5|.07} \\ &= 16,138\end{aligned}$$

You can quickly verify that the minimum contribution will not increase the maximum deductible limit:

$$\begin{aligned}\text{12/31 min} &= 1.07(65,000 + 30,126 + 16,138 - 12,000) \\ &= 106,212\end{aligned}$$

The final calculation of the deductible limit is usually the unfunded current liability (UCL). You can't calculate that value, since you don't know the current liability values. The final deductible limit is 136,582.

Answer is E

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Problem 42 – Page 1

Similar to 2003 #6

As in earlier problems, this one has a salary scale, and a cost method given as Unit Credit. One key to this problem is knowing that the calculations are done using Projected Unit Credit (PUC).

The main "trick" to the problem is that you must calculate the experience G/L for 2004. Since the 2004 contribution is paid at 12/31/2004, the only source of G/L is the salary experience.

You need to calculate the PUC accrued liability and normal cost at 01/01/2005. Under PUC, the accrued liability is defined as the present value of the "funding accrued benefit" (FAB). The normal cost is defined as the present value of the change in the FAB:

$$\begin{aligned} \text{AL} &= \text{PV (FAB)} \\ \text{NC} &= \text{PV (FAB)} \end{aligned}$$

The 1.412(c)(3)-1 regulations define "funding accrued benefit":

1. Project pay to retirement age
 2. Calculate the projected benefit
 3. Pro-rate the projected benefit based on service today versus service at retirement.
- This pro-rata calculation must reflect each year's rate of benefit accrual.

For a final average pay plan, you get the same value for the FAB if you apply the benefit formula to past service, but use projected earnings. For a career average pay plan, you must do the calculation as described in the regulations.

Age 54 at 01/01/05
Past service 9
2004 pay 55,000 (age 53 pay)

Since the benefit accrues at the same rate each year, the accrued liability equals the normal cost multiplied by past service:

$$\begin{aligned} \text{FAB} &= 1.5\%(\text{Past service})(\text{Projected FAE3}) \\ \text{NC} &= 1.5\%(1.0)(\text{Projected FAE3}) \\ \text{NC} &= \text{AL} / (\text{Past service}) \end{aligned}$$

Since you are given the PUC accrued liability at 01/01/2004, you don't need to do detailed calculations of the accrued liability and normal cost at 01/01/2005. You can simply work from the age 53 accrued liability, and allow for actual versus expected pay:

	2004 Actual	2005 Expected	2005 Actual
Valuation pay	55,000	1.04(55,000)	55,000
Normal Cost	45,136 / 8 = 5,642	1.07(5,642) = 6,037	6,037 * 55,000/[1.04(55,000)] = 5,805
Accrued Liability	45,136	6,037 * 9 = 54,332	54,332 * 55,000/[1.04(55,000)] = 52,243 = 5,805(9)

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Problem 42 – Page 2

$$\begin{aligned}\text{Non-inv G/L} &= AL_1 - {}_eAL_1 \\ &= 54,332 - 52,243 \\ \text{Gain} &= 2,090\end{aligned}$$

The last step of the problem is to calculate the minimum required contribution at 01/01/2005. You can use the actuarial equation of balance to solve for the credit balance at 12/31/04:

$$\begin{aligned}01/05 \text{ UAL} &= AL - AAV \\ &= 52,243 - 11,500 \\ &= 40,743\end{aligned}$$

$$\begin{aligned}01/05 \text{ UAL} &= O/S \text{ 412 bases} - CB - ARA \\ &= 45,136 * \ddot{a}_{\overline{29}|.07} / \ddot{a}_{\overline{30}|.07} - 2,090 \text{ Gain} - CB - ARA\end{aligned}$$

$$40,743 = 3,399 * \ddot{a}_{\overline{29}|.07} - 2,090 - CB - 0$$

$$CB = 1,826$$

The final step is setting up the MFSA to calculate the minimum contribution.

$$\begin{aligned}\text{Gain amort} &= 2,090 \div \ddot{a}_{\overline{5}|.07} \\ &= 476\end{aligned}$$

2005 Minimum Funding Standard Account

Charges		Credits	
Normal Cost	5,805	Credit Balance	1,826
IAL amortization	3,399	Gain amortization	476
		01/01/05 minimum	x
NO interest		NO interest	
Total charges	<u>9,204</u>	Total credits	<u>x + 2,302</u>

Based on the size of the UAL, you can ignore the §412 Full Funding Limitation. The minimum contribution at 01/01/05 is $6,902 = 9,204 - 2,302$. As usual, it is a cheap trick to ask for the minimum contribution at 01/01.

Answer is B

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Problem 43

The key to this problem is *Not Freaking Out* when you see questions about mandatory employee contributions

Apparently someone on the exam committee had a nice three martini lunch, since this topic is not on the syllabus for EA-2A.

The problem asks for the employer provided benefit. This is the difference between the total accrued benefit and the employee provided benefit.

The employee provided benefit is defined as the benefit provided from mandatory employee contributions. The employee contributions must be projected with interest at the 417(e)(3) rate to age 65. The employee provided benefit is that amount divided by a life annuity factor at the 417(e)(3) rate.

Age 65 at 01/01/05

$$\begin{aligned}\text{EE provided ben} &= (\text{EECWI at 65}) / \ddot{a}_{65}^{(12)} \\ &= 20,000 / 8.50 \\ &= 2,353\end{aligned}$$

$$\begin{aligned}\text{ER provided ben} &= \text{Total accrued benefit} - \text{ER provided benefit} \\ &= 4,000 - 2,353 \\ &= 1,647\end{aligned}$$

Answer is C

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Problem 44 – Page 1

Similar to 2001 #41

The key point of this problem is whether you know how to calculate the Full Funding Limitation (FFL) under §404 when you have non-deductible contributions (NDC). The method of calculation is outlined in Revenue Ruling 82-125, which says that you should adjust the FFL by the amount of the NDC, but with no interest adjustment.

Based on the default exam conditions, the AAV given in problems is the appropriate value for minimum funding calculations. This is consistent with the description of the assets in the problem. If a contribution has been paid to the trust, it should be considered as part of the §412 assets, regardless of whether or not it has been deducted.

General rule - no NDC

Assume AAV = assets used for §412 costs

$$\text{ERISA FFL} = (1+i)(\text{NC}+\text{AL}) - (1+i)[\text{lesser of MV, AAV}]$$

Intuitive FFL - with NDC

If you did not know the rules in RR 82-125, you would adjust the FFL definition by substituting the §404 asset definition in place of the §412 definition:

$$\begin{aligned}\text{\$404 AAV} &= \text{AAV} - \text{NDC} \\ \text{ERISA FFL} &= (1+i)(\text{NC}+\text{AL}) - (1+i)[\text{lesser of } \text{\$404 MV}, \text{\$404 AAV}] \\ &= (1+i)(\text{NC}+\text{AL}) - (1+i)[\text{lesser of } (\text{MV}-\text{NDC}, \text{AAV}-\text{NDC})] \\ &= (1+i)(\text{NC}+\text{AL}) - (1+i)[\text{lesser of MV, AAV}] + (1+i)(\text{NDC})\end{aligned}$$

RR 82-125 - with NDC

But that is not the definition shown in the examples in RR 82-125. The difference is that the NDC should not get any interest credit, which produces a slightly lower FFL:

$$\begin{aligned}\text{\$404 AAV} &= \text{AAV} - \text{NDC} \\ \text{ERISA FFL} &= (1+i)(\text{NC}+\text{AL}) - (1+i)[\text{lesser of MV, AAV}] + \text{NDC}\end{aligned}$$

In this problem the NDC equals the 2004 contribution of 150,000 minus the deductible limit of 100,000. The problem asks you to calculate the §404 FFL.

$$\begin{aligned}\text{\$404 "ERISA" FFL} &= (1+i)(\text{UC NC} + \text{UC AL}) - (1+i)(\text{lesser MVA, AAV}) + \text{NDC} \\ &= 1.07(75,000 + 1,000,000 - 900,000) + 50,000 \\ &= 237,250\end{aligned}$$

$$\begin{aligned}\text{\$404 "RPA 94" FFL} &= .90 (12/31 \text{ CL}) - (1+i)(\text{AAV}) + \text{NDC} && \text{(if no benefit payments)} \\ &= .90(1,250,000) - 1.07(900,000) + 50,000 \\ &= 212,000\end{aligned}$$

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Problem 44 – Page 2

The final §404 FFL is the greater of the two values, or 237,250.

Answer is C

Note that the end of year asset value (if any) should be used in calculating the RPA '94 FFL. The reason is that any benefit payments during the year should be reflected at the valuation rate in the assets. They presumably are included in the end of year asset value. They would be accumulated at the current liability interest rate in the end of year current liability value.

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Problem 45 – Page 1

Similar to 2004 #33

One key to this problem is that the retirement gain / loss calculation is simply the difference between two accrued liability values. One accrued liability is calculated as an active employee, and another is calculated as a retired employee.

Another key point is that both employees will generate an experience loss based on salary increases other than expected. You need to calculate the Unit Credit accrued liability at 01/01/2004. The accrued liability is defined as the present value of the accrued benefit:

$$\begin{aligned}\text{Non-inv Loss} &= AL_1 - {}_eAL_1 \\ 01/01/05 {}_eAL_1 &= (1+i)^*(NC_0 + AL_0) - (\text{benefit payments} + \text{interest})\end{aligned}$$

$$\begin{aligned}\text{Retired AL} &= \text{PV of Early retirement benefit} \\ \text{Active AL} &= \text{PV of AB}\end{aligned}$$

<u>Description</u>	<u>Smith</u>	<u>Jones</u>
01/2004 Age	49	54
Past service	14	19
2003 pay	50,000	75,000
Accrued benefit	$1\%(14)(50,000)$ $= 7,000$	$1\%(19)(75,000)$ $= 14,250$
2004 AL	$7,000 (D_{65} / D_{49}) \ddot{a}_{65}^{(12)}$ $= 7,000(1.07)^{-16}(8.50)$ $= 20,155$	$14,250 (D_{65} / D_{54}) \ddot{a}_{65}^{(12)}$ $= 14,250(1.07)^{-11}(8.50)$ $= 57,546$
2004 NC	$500 (D_{65} / D_{49}) \ddot{a}_{65}^{(12)}$ $= 20,155 / 14$ $= 1,440$	$750 (D_{65} / D_{54}) \ddot{a}_{65}^{(12)}$ $= 57,546 / 19$ $= 3,029$
2005 ${}_eAL_1$	$1.07(1,440 + 20,155) - 0$ $= 23,106$	$1.07(3,029 + 57,546) - 0$ $= 64,815$

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Problem 45 – Page 2

At 01/01/05, you can calculate the actual accrued liabilities:

<u>Description</u>	<u>Smith</u>	<u>Jones</u>
01/2005 Age	50	55
Past service	15	20
2004 pay	60,000	80,000
Accrued benefit	1%(15)(60,000) = 9,000	1%(20)(80,000) = 16,000
Status	Active	Retired
Early retirement benefit	N/A	16,000[1-5%(65-55)] = 8,000
2005 AL	9,000 (D_{65} / D_{50}) $\ddot{a}_{65}^{(12)}$ = 9,000(1.07) ⁻¹⁵ (8.50) = 27,727	8,000 $\ddot{a}_{55}^{(12)}$ = 8,000(10.50) = 84,000
Non-inv loss: $AL_1 - {}_eAL_1$	27,727 - 23,106 = 4,621	84,000 - 64,815 = 19,185

The total loss is 23,807.

Answer is D

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Problem 46

This is a straightforward question on how a plan change affects the MFSA. The new MFSA base is equal to the difference in the Unit Credit accrued liability due to the plan change.

$$UAL = \text{new UC AL} - \text{old UC AL}$$

You need to calculate the values after the plan change. You can simply pro-rate the values given in the problem.

Description	Old plan	New plan	Difference
Normal cost	350,000	$(30/25)*350,000$	$350,000/5 = 70,000$
Accrued liability	6,500,000	$(30/25)*6,500,000$	$6,500,000/5 = 1,300,000$

Now you can calculate the change in the minimum contribution at 12/31:

$$179,662 = 1.07*(70,000 + 1,300,000/\ddot{s}_{\overline{30}|.07}).$$

Answer is D

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