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FALL 2014 EA-2F EXAM SOLUTIONS

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Fall 2014 EA-2F Exam Solutions

These solutions were prepared based on the law as in effect at May 31, 2014. The Pension Protection Act of 2006 (PPA 2006) was included on the syllabus for the first time on the 2007 exam.

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!

Revision History:

September 3, 2019	Corrected solutions for problems 29 and 37
September 7, 2018	Corrected solutions for problems 22, 29 and 37
August 14, 2017	Corrected note at end of solution for problem 2
October 19, 2016	Corrected solutions for problems 30, 33 and 40
September 12, 2016	Corrected solutions for problems 17, 26, 29 and 47
November 2, 2015	Corrected solution for problem 37
October 18, 2015	Corrected solution for problem 1
October 15, 2015	Corrected solution for problem 45
August 2, 2015	Original solutions

<u>Exam Year</u>	<u>Pass Mark</u>	<u>Percentage Who passed</u>
2014	112	50.2
2013	103	43.8
2012	103	42.9
2011	111	48.7
2010	109	45.8
2009	107	46.7
2008	112	58.2
2007	112	53.3
2006	113	58.6

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For single employer exam problems involving the minimum contribution, you should use the following sequence of steps:

1. Calculate the Funding shortfall, which is defined as the Funding target less the AAV, after reduction for both the carryover balance (CB) and the prefunding balance (PB).
2. If the Funding shortfall is greater than zero, you should check the Shortfall base exemption. If the Funding shortfall is limited to zero, then you can skip the Shortfall base exemption - all the shortfall and waiver bases are considered fully amortized.
3. The shortfall base exemption is a messy calculation. Define the “modified funding shortfall” as the modified funding target less the modified assets. If the “modified funding shortfall” is less than or equal to zero, then you would not have to set up the Shortfall base.

Modified assets

If any part of the prefunding balance is used to reduce the minimum required contribution, the modified assets are equal to AAV - PB. Otherwise, the modified assets equal the AAV with no reduction.

Based on 2014 exam conditions 31 and 32, the plan sponsor does elect to apply both the CB and the PB against the MRC. As a result, you should set up the modified asset as AAV - PB. In general, the only time you should not do this is when the problem states that the plan sponsor does not elect to apply the CB and the PB against the MRC, or when the plan's funding ratio for the prior year is less than 80% (see note 6 on next page).

Modified funding target

This is equal to the "applicable percentage" times the funding target. Starting in 2011, the applicable percentage became 100%, which simplifies things considerably. In most problems, the modified funding shortfall is identical to the funding shortfall.

4. If the plan satisfies the Shortfall base exemption, the Shortfall amortization installment for the year is zero. If the plan does not satisfy the Shortfall base exemption, you must calculate the amount of the new Shortfall base, as well as the new Shortfall amortization installment.

The new shortfall base is equal to

- 100% times the Funding target
- Minus the Actuarial asset value reduced by both CB and PB
- Minus the present value of prior years' shortfall and waiver amortization installments

$$\text{S/F Amort base} = (\text{Applicable \%})(\text{Funding target}) - (\text{AAV}-\text{CB}-\text{PB}) - (\text{PV of PY Amort})$$

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Single employer minimum contribution steps - continued:

5. If the Funding shortfall is greater than zero, then the Minimum required contribution (MRC) is equal to the sum of the Target normal cost, the shortfall amortizations, and the waiver amortization. If the Funding shortfall is limited to zero, then the Minimum required contribution is equal to the Target normal cost, plus the Funding target less the AAV (after reduction for both the CB and the PB).
6. If the problem asks for the “smallest amount that satisfies the minimum funding standard”, you should apply both the CB and the PB towards the MRC. If the problem asks for the “Minimum required contribution”, you do not reflect the CB and PB.

Funding ratio

2014 exam condition 31 states that the plan sponsor's funding ratio for the prior year was at least 80%, so they are eligible to apply both the CB and the PB against the MRC. If a problem gives you the prior year's valuation results, you should not rely on exam condition 31. You should check the "funding ratio" for the prior year to be sure that the plan can apply the CB and the PB towards the MRC:

$$\text{Funding ratio} = \frac{\text{AAV} - \text{PB}}{\text{Funding Target (non At-Risk)}}$$

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For multiemployer exam 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 is the “smallest amount to satisfy the minimum funding standard” as defined in 2014 exam condition 35. This 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. The UCL limit is equal to $140\% \times (\text{Current Liability}) - \text{AAV}$. If this exceeds the deductible limit in step 4, then the final deductible limit will equal the UCL limit. This UCL limit ignores recent benefit improvements for small plans with highly compensated employees.

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Problem 1 – Page 1

Similar to 2011 #10

This is the second question asked on the definition of the funding target attributable to a flat benefit. At 1.430(d)-1(c)(1)(ii)(D), it states that, for a benefit not based on service, you use a simple pro-rata portion of the benefit to calculate the funding target.

The fraction is
$$\frac{\text{Service on first day of the plan year}}{\text{Service at time of event where benefit becomes payable}}$$

The participant is currently eligible for early retirement. The supplemental benefit is available upon retirement at age 60 with 15 years of service. This participant is currently age 60 with 20 years of service.

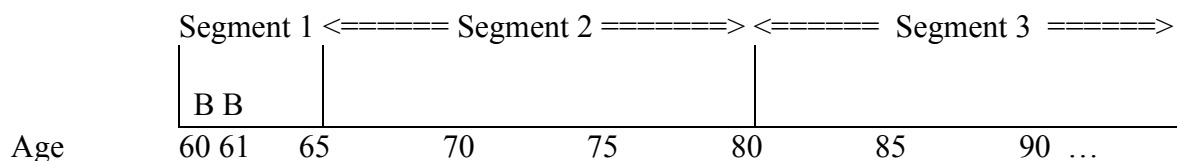
The event that causes the benefit to be paid is retirement at age 60 (or age 61). At age 60, the pro-rata fraction is equal to 20/20. At age 61, the pro-rata fraction is equal to 20/21.

Valuation calculations

You need to calculate the Funding target at 01/01/2015. The first step is to determine the “accrued benefit” at the valuation date.

Valuation date	01/01/2015	01/01/2016
Age	60	61
Past service	20	21
Accrued portion of supplement	$(20/20)(12,000)$ = 12,000	$(20/21)(12,000)$ = 11,429

The temporary supplement payments stop at age 62, so they will be valued using the first segment rate of 5%:



There are two retirement decrements at ages 60 and 61. You can calculate the funding target for the temporary supplement by first assuming 100% retirement at each age, then combining the results to reflect the decrements.

$$\begin{aligned} \text{AL}_{60} &= \text{PV of supplement assuming 100\% retirement decrement at age 60} \\ &= 12,000(N_{60}^{(12)} - N_{62}^{(12)}) / D_{60} \quad \text{all at segment 1 rate} \\ &= 12,000(684,044 - 586,684) / 51,213 \\ &= 22,813 \end{aligned}$$

The commutation factors are based on the male factor tables given with the exam.

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Problem 1 – Page 2

Revised 10/18/15

$$\begin{aligned} \text{AL}_{61} &= \text{PV at age 60 of supplement, assuming 100\% retirement decrement at age 61} \\ &= 11,429(1.05)^{-1} (N_{61}^{(12)} - N_{62}^{(12)}) / D_{61} && \text{all at segment 1 rate} \\ &= 11,429(.9524)(634,053 - 586,684)/48,545 \\ &= 10,621 \end{aligned}$$

Now you must allow for the assumption that 35% of the participants are assumed to retire at age 60, and 25% of the remaining participants retire at age 61:

$$\begin{aligned} \text{FT} &= 35\%(\text{AL}_{60}) + (1-35\%)(25\%)(\text{AL}_{61}) \\ &= .35(22,813) + .65(.25)(10,621) \\ &= 7,985 + 1,726 \\ &= 9,710 \end{aligned}$$

Answer is B

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Problem 2 – Page 1

Similar to 2013 #41

The key to working this problem is the special rule in the final 1.430 regulations regarding bringing forward the prefunding balance (PB) based on two different interest rates. The calculation is based on the rule shown in example 4 of the final regulation. The portion of the prefunding balance that is attributed to the sponsor's use of the prefunding balance at the beginning of the year must be increased with interest based on the plan's rate of return on assets.

2015 Carryover balance

The problem asks for the prefunding balance at 01/01/16. The problem states that the plan sponsor elects to use 15,000 of the funding balances to satisfy the minimum contribution requirement. One point of the problem is that you must reduce the carryover balance. You can't reduce the prefunding balance before completely eliminating the carryover balance.

Remaining
01/2015 CB = 25,000 - 15,000 CB applied
 = 10,000

Excess contribution

You can calculate the amount of the excess contribution at 01/01/2015. You need to compare the present value of the contribution paid at 12/01/2015 to the MRC. The present value is calculated using the effective rate of interest for the 2015 plan year:

PV of contrib = $115,000 \times (1.06)^{-11/12}$
 = 109,019

Addition to
2015 PB = 109,019 - (100,000 MRC - 15,000 CB applied)
 = 9,019 excess contribution + 15,000 CB applied

If there was no CB used, then the 01/2016 PB equals the sum of the 01/2015 PB (brought forward using the rate of return on assets for the 2015 plan year) plus the excess contribution (brought forward with the effective rate of interest for the 2015 plan year). But the calculation is not done that way, due to the special rule in the final 1.430 regulations.

The portion of the prefunding balance that is attributed to the sponsor's use of the carryover balance at the beginning of the year must be increased with interest based on the 2015 rate of return on assets.

There is a silly trick to the solution for this problem. The first time I worked it, I misread the rate of return on assets as 5.0%. But this value is shown in parentheses, so it is a negative 5.0%. I got lucky, because the result is way outside the implied range for answer E.

Problem 2 – Page 2

Revised 08/14/17

$$\begin{aligned} 01/2016 \text{ PB} &= (1.06)(9,019 \text{ excess contribution}) + (1-.05)(75,000 \text{ PB} + 15,000 \text{ applied}) \\ &= 9,560 + 85,500 \\ &= 95,060 \end{aligned}$$

Answer is C

NOTES

1. You get a slightly different numerical result if you use simple interest to calculate the excess contribution. The resulting PV of the contribution is 109,005 and the 01/2016 PB is 95,045. As expected, this is in the same answer range.
2. There is a way to check your calculation, which is to ignore the statement about applying the CB towards the minimum contribution requirement. The sum of the CB and the PB should be the same, regardless of the amount of the CB applied. Following the prior calculation, the 01/2016 CB is $9,500 = .95(25,000 - 15,000)$. The sum of the CB and the PB is $104,560 = 9,500 + 95,060$.

Now assume the employer does not elect to apply the CB towards the minimum contribution requirement. The 01/2015 carryover balance would be 25,000, and the prefunding balance would be 75,000. Using compound interest, the 2015 excess contribution would be $9,019 = 109,019 - 100,000$.

$$\begin{aligned} 01/2016 \text{ PB} &= (1.06)(9,019 \text{ excess contribution}) + (1-.05)(75,000 \text{ PB}) \\ &= 9,560 + 71,250 \\ &= 80,810 \end{aligned}$$

$$\begin{aligned} 01/2016 \text{ CB} &= (1-.05)(25,000 \text{ CB}) \\ &= 23,750 \end{aligned}$$

$$\begin{aligned} \text{PB} + \text{CB} &= 80,810 + 23,750 \\ &= 104,560 \end{aligned}$$

As expected, the sum of the PB and CB is the same value.

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Problem 3 – Page 1

Similar to 2011 #26

The key point to the problem is calculating the Projected Unit Credit (PUC) accrued liability and the normal cost. 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 for the year.

$$AL = PV (FAB)$$

$$NC = PV (\Delta FAB)$$

The 1.412(c)(3)-1 regulation defines "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.

01/01/15 valuation calculations

The plan benefit is based on the final pay. The normal retirement age is 65 by default. You need to project pay to age 64.

01/2015 Age	40
Past service	10
2014 pay (age 39)	77,000
Projected pay @ 64	$= 77,000 * (1.03)^{25}$
	$= 161,221$

Funding Accrued benefit - ARA 65	$2.0\%(10)(FAE5)_{65}$
Δ Funding Accrued benefit - ARA 65	$2.0\%(1)(FAE5)_{65}$
	$2.0\%(161,221)$
	$= 3,224$

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Problem 3 – Page 2

The commutation functions typically include both interest and mortality. Based on 2014 exam condition 18, there are no pre-retirement decrements. The present values should use interest-only discounting prior to benefit commencement age.

$$\begin{aligned} 01/01/15 \text{ PUC NC} &= 3,224(v^{25} {}_{25}p_{40}) \ddot{a}_{65}^{(12)} \\ &= 3,224(1.07)^{-25}(1.0)(10.11) \\ &= 6,006 \end{aligned}$$

Answer is B

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Problem 4 – Page 1

Similar to 2013 #44

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.

The key to this problem is reading the question carefully. There is a plan amendment effective 01/01/2015. The problem gives you 2015 valuation results that do not reflect that amendment.

The problem asks for the "smallest amount" at 12/31/2015. Based on 2014 exam condition 35, the "smallest amount" reflects offsetting the funding standard account credit balance (CB) against the minimum contribution.

2015 Plan amendment

One simplification to the question is that you do not need to set up a new G/L base at 01/01/2015. The problem gives you the MFSA amortization charges and credits before the plan amendment, which already reflects the G/L base.

The problem gives you different early retirement reductions for retirement before 01/01/2015 and on and after that date. This affects the benefits at retirement, since the assumptions allow for 100% assumed retirement at age 62. You can determine the normal cost and accrued liability before and after the plan amendment. The plan amendment only affects the active participants at 01/01/2015.

Since the cost method is Unit Credit, both the normal cost and accrued liability will reflect the new benefit level:

	Before Amendment	Ratio of early Retirement reductions	After amendment
Active accrued Liability	1,170,000	$\ast \frac{[1-(65-62)(3\%)]}{[1-(65-62)(5\%)]} =$	1,252,588
Normal cost	240,000	$\ast \frac{[1-(65-62)(3\%)]}{[1-(65-62)(5\%)]} =$	256,941
Plan chg base	$= 1,252,588 - 1,170,000$		
	$= 82,588$		
Plan amort	$= 82,588 / \ddot{a}_{15 .07}$		
	$= 8,475$		

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Problem 4 – Page 2

Now you can set up the MFSA and calculate the 12/31/15 “smallest amount”:

2015 Minimum Funding Standard Account			
Charges		Credits	
Normal Cost	256,941	Credit Balance	15,000
Amortization charges	140,000	Amortization credits	60,000
Plan chg amortization	8,475	12/31 minimum	x
7% interest	28,379	7% interest	5,250
Total charges	<u>433,795</u>	Total credits	<u>x + 80,250</u>

The “smallest amount” at 12/31/15 is $353,545 = 433,795 - 80,250$. This includes interest to 12/31, and reflects offsetting the credit balance against the minimum contribution.

Answer is D

NOTE

You don’t need to think too hard about the FFL. Since the UAL is very large, the FFL will have no effect on the MFSA.

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Problem 5

Similar to 2011 #04

The key to working this problem is the special rule in the final 1.430 regulations regarding bringing forward the carryover balance (CB) or the prefunding balance (PB) based on two different interest rates. The calculation is based on the rule shown in example 4 of the final regulation. The portion of the prefunding balance that is attributed to the sponsor's use of the prefunding balance at the beginning of the year must be increased with interest based on the plan's rate of return on assets.

The problem asks for the maximum amount that can be added to the prefunding balance at 01/01/16. The problem states that the plan sponsor elects to offset 250,000 of the CB and PB against the minimum required contribution (MRC) under IRC 430. This means the entire CB of 170,000 is used, and 80,000 of the PB is used to satisfy the MRC.

You are given the minimum required contribution as 260,000. You can calculate the amount of the excess contribution at 01/01/2015. You need to compare the present value of the actual contribution to the MRC. The present value is calculated using the effective rate of interest for the 2015 plan year:

01/01/15

$$\begin{aligned}\text{PV of contrib} &= 300,000*(1.062)^{-6/12} + 200,000*(1.062)^{-18/12} \\ &= 473,855\end{aligned}$$

$$\begin{aligned}\text{Excess contrib} &= 473,855 - (260,000 \text{ MRC} - 170,000 \text{ CB} - 80,000 \text{ PB}) \\ &= 213,855 \text{ excess contribution} + 250,000 \text{ balances applied}\end{aligned}$$

If there were no balances used, then the 01/01/2016 PB is increased by the excess contribution brought forward with the effective rate of interest for the 2015 plan year. But the calculation is not actually done that way in this problem. The portion of the prefunding balance that is attributed to the sponsor's use of the CB and PB at the beginning of the year must be increased with interest based on the plan's rate of return on assets.

Increase in

$$\begin{aligned}\text{01/2016 PB} &= 213,855*(1.062) + 250,000(1.2250) \\ &= 533,364\end{aligned}$$

Answer is D

NOTE

You could work the problem using simple interest. The present value of the 2015 contributions is $473,641 = 300,000/[1 + (6/12)*(6.2\%)] + 200,000/[(1.062)*\{1 + (6/12)*(6.2\%)\}]$. The increase in the 01/2016 PB is $533,137 = 213,641*(1.062) + 250,000(1.2250)$, which is in the same answer range.

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Problem 6

This problem is a fairly simple one on setting actuarial assumptions for multiemployer plans.

I. FALSE

II. FALSE

There are no MFSA amortization bases under the Aggregate cost method (except for waivers).

III. FALSE

The plan already has a mortality decrement, so there is no reason to change the assumptions. If the plan did not have a mortality decrement, you might need to add one so that each individual assumption is reasonable.

None of the items are true.

Answer is A

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Problem 7

TRUE

Based on the rule in IRC 430(d)(2), plan provisions can be adopted after the end of the plan year, yet be deemed as effective on the first day of the plan year. The plan administrator must elect to make the amendment effective earlier.

For single employer plans, the amendment must be adopted within 2 1/2 months after the end of the plan year. For multiemployer plans, the amendment must be adopted within two years after the end of the plan year.

Answer is A

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Problem 8 – Page 1

Similar to 2013 #52

The main point of the problem is correctly calculating the benefits for both the Funding target and the Target normal cost. You must be careful to apply the 401(a)(17) limit to each year's pay. Since the participant's pay has decreased, it is somewhat confusing.

PLAN BENEFIT

The plan benefit is based on the three year final average pay. You need to apply the §401(a)(17) limit to each year of pay. The problem states that the assumed pay increase is 3% per year, but you can't allow for any increases in the 401(a)(17) limit.

The first step is determining the pay that can be used to calculate Smith's accrued benefit. Since the problem asks for the Target normal cost, you must calculate the accrued benefit at both 01/01/2014 and 01/01/2015:

Valuation date	01/01/14	01/01/15
Age	64	65
Past service	3	4
Participation service	1	2
Prior year's pay	245,000	245,000*(1.03) = 252,350

In general, the 401(a)(17) limit for a calendar year applies to any plan year that begins in that calendar year:

Plan Year Beginning	Applicable 401(a)(17) limit	Plan year Ending	Plan year Pay	Limited pay
01/01/11	245,000	12/31/11	275,000	245,000
01/01/12	250,000	12/31/12	275,000	250,000
01/01/13	255,000	12/31/13	245,000	245,000
01/01/14	260,000	12/31/14	252,350	252,350

Valuation date	01/01/14	01/01/15
3 year average pay	$(245,000 + 250,000 + 245,000) / 3$ = 246,667	$(250,000 + 245,000 + 252,350) / 3$ = 249,117
Accrued benefit	$3\%(3)(246,667)$ = 22,200	$3\%(4)(249,117)$ = 29,894

The key point of the problem is that you also need to consider the 415 limit. The reason is that the participant only has one year of participation service at 01/01/2014.

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Problem 8 – Page 2

415 COMP LIMIT

The §415(b)(1)(B) compensation limit is based on the high consecutive three years. It is reduced when service is less than ten years. You previously calculated the final 3 year average compensation for the plan benefit.

415 DOLLAR LIMIT

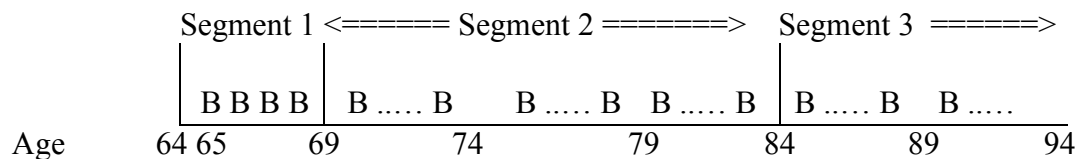
The next step is calculation of the §415 dollar limit under §415(b)(1)(A). The dollar limit is reduced when participation is less than ten years. Smith has 1 year of participation service at 01/01/2014:

Valuation date	01/01/14	01/01/15
415 compensation limit	$(3/10)*246,667 = 74,000$	$(4/10)*249,117 = 99,647$
415 dollar limit	$(1/10)*210,000 = 21,000$	$(2/10)*210,000 = 42,000$
Final 415 limit	21,000	42,000
Final accrued benefit limited by 415	21,000	29,894

$$\begin{aligned}\Delta AB &= 29,894 - 21,000 \\ &= 8,894\end{aligned}$$

TARGET NC

The Target normal cost is defined as the present value of the change in the accrued benefit. It is similar to the traditional Unit Credit normal cost. Based on the default exam conditions, normal retirement age is 65, and the benefit is assumed payable monthly, starting at normal retirement age. Since the participant is currently age 64, their benefit payments will be valued using all three segment rates:



Here is the formula for the target normal cost using monthly annuity rates:

$$\text{Age 64 NC} = 8,894 * \left[{}_1\ddot{a}_{64:4|\text{seg}_1}^{(12)} + {}_5\ddot{a}_{64:15|\text{seg}_2}^{(12)} + {}_{20}\ddot{a}_{64|\text{seg}_3}^{(12)} \right]$$

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Problem 8 – Page 3

Now you need to express these annuities in terms of commutation functions. The problem states that Smith is a female employee. The commutation factors are based on the female factor tables given with the exam.

One complication is that there are no pre-retirement decrements. The period between age 64 and 65 must be calculated using an interest-only discount.

$$1| \ddot{a}_{64:4| \text{seg}_1}^{(12)} = (1.05)^{-1} (N_{65}^{(12)} - N_{69}^{(12)}) / D_{65} \quad \text{all at segment 1 rate}$$

$$5| \ddot{a}_{64:15| \text{seg}_2}^{(12)} = (1.06)^{-1} (N_{69}^{(12)} - N_{84}^{(12)}) / D_{65} \quad \text{all at segment 2 rate}$$

$$20| \ddot{a}_{64 \text{seg}_3}^{(12)} = (1.07)^{-1} N_{84}^{(12)} / D_{65} \quad \text{all at segment 3 rate}$$

$$\begin{aligned} \text{Age 64 NC} &= 8,894 \left[\frac{(1.05)^{-1}(488,388 - 347,839)}{39,304} + \frac{(1.06)^{-1}(167,356 - 25,502)}{21,225} \right. \\ &\quad \left. + \frac{(1.07)^{-1}(11,104)}{11,529} \right] \\ &= 8,894[.9524*3.5759 + .9434*6.6833 + .9342*.9631] \\ &= 94,373 \end{aligned}$$

Answer is B

NOTE

This is exactly the type of IRC 415 problem that I expect on the EA-2F exam. It is primarily a funding question, and the calculations of the 415 limit were not overly complex.

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Problem 9

The problem states that the plan has actuarially reduced early retirement benefits from age 55 up to age 60. The early retirement benefits are unreduced starting at age 60. In the past, retirements have occurred between ages 55 and 65. The average retirement age has been 62 in the past, and the actuary expects this not to change significantly.

You need to look at each of the sets of retirement rates to see which conforms most closely to the information previously given.

I. Rates varying from 5% at age 55 to 15% at age 60 to 15% at age 64

This set of rates seems to be OK - at least as compared to the alternatives below.

II. Rates varying from 0% at age 55 to 10% at age 60 to 0% at age 64

These rates do not match the age distribution - there are no retirements assumed at ages 55, 56, 63 and 64. There should be more participants retiring at ages 63 and 64, since the retirement benefit is not reduced at those ages. The average retirement age seems skewed below age 62.

III. Rates varying from 20% at age 55 to 10% at age 60 to 20% at age 64

This set of rates is similar to item I, but there are too many retirements prior to age 60, when benefits are actuarially reduced. Instead, there should be a noticeable increase in the level of retirements starting at age 60, due to the availability of unreduced retirement benefits.

Only item I seems acceptable

Answer is A

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Problem 10 – Page 1

Similar to 2012 #37

The key to this problem is the calculation of the Funding target, Target normal cost and the Shortfall amortization base at 01/01/2015 under IRC Section 430. This plan has a funding standard carryover balance (CB) of 1,000 and a prefunding balance (PB) of 5,000 at 01/01/2015.

The problem asks for the "minimum required contribution" for 2015. In general, the MRC is defined as the target normal cost plus the shortfall amortization charge and the waiver amortization charge, all at the valuation date. Based on 2014 exam condition 34, the plan sponsor does not offset the carryover balance (CB) or the prefunding balance (PB) against the minimum contribution under IRC 430.

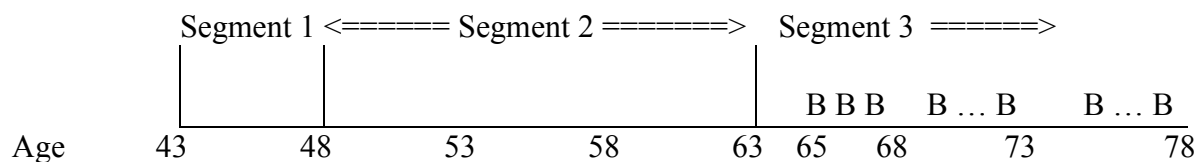
Valuation calculations

You need to determine values for the Funding target and the Target normal cost at 01/01/2015. You are told that Smith is the only participant. One point of the problem is handling the 3% salary scale. At 01/01/2016, the final pay reflects the 3% increase for the 2015 pay.

Valuation date	01/01/2015	01/01/2016
Age	43	44
Past service	15	16
Final pay	100,000	$1.03 \times 100,000 = 103,000$
Accrued benefit	$1.5\%(15)(100,000)$ $= 22,500$	$1.5\%(16)(103,000)$ $= 24,720$

$$\Delta \text{ Accrued benefit} = 2,220 = 24,720 - 22,500$$

The participant is currently 22 years from retirement, so their benefit payments will be valued using the third segment rate:



$$\begin{aligned}
 FT &= \text{PV of accrued benefit} \\
 &= 22,500(D_{65} / D_{43})\ddot{a}_{65}^{(12)} \quad \text{at the third segment rate} \\
 &= 22,500(1+i)^{-22}({}_{22}p_{43})(\ddot{a}_{65}^{(12)}) \\
 &= 22,500(1.07)^{-22}(1.0)(10.11) \\
 &= 51,344
 \end{aligned}$$

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Problem 10 – Page 2

There are three segment interest rates, but the benefit payments are discounted back to the valuation date using a single rate, based on which segment they fall into. The present value of the benefit payments at 65 is calculated using the third segment rate of 7%, and they are all discounted to the valuation date at 7%. With no pre-retirement decrements, the D/D terms are only based on the 7% interest rate.

$$\begin{aligned}\text{TNC} &= \text{PV of change in accrued benefit} \\ &= 2,220(D_{65} / D_{43}) \ddot{a}_{65}^{(12)} \quad \text{at the third segment rate} \\ &= (2,220/22,500)*51,344 \\ &= 5,066\end{aligned}$$

Funding Shortfall

The funding shortfall is defined as the excess of the funding target over the 430(f)(4)(B) assets, which equals the actuarial value of assets less the prefunding balance and the carryover balance.

$$\begin{aligned}\text{Funding S/F} &= \text{Funding target} - (\text{AAV} - \text{CB} - \text{PB}) \\ &= 51,344 - (55,000 - 1,000 - 5,000) \\ &= 2,344\end{aligned}$$

Shortfall Base Exemption

The transition rule for the applicable percentage expired at the end of the 2010 plan year. The modified funding shortfall is quite different from the previously calculated Funding shortfall:

$$\begin{aligned}\text{Modified S/F} &= 100\% * (\text{Funding target}) - (\text{AAV} - \text{PB}) \\ &= 51,344 - (55,000 - \text{zero}) \\ &= \text{zero}\end{aligned}$$

Note that the modified funding shortfall does not offset the PB. This is because the plan sponsor did not elect to use the PB to satisfy the 2015 minimum.

Shortfall amortization installment

The plan is eligible for the shortfall base exemption. The problem states that there were no shortfall amortization bases established before 2015. The shortfall amortization charge is zero.

(next page)

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Problem 10 – Page 3

"Minimum Required Contribution"

In general, the minimum required contribution (MRC) is defined as the target normal cost plus the shortfall amortization charge and the waiver amortization charge, all at the valuation date:

$$\begin{aligned}\text{MRC} &= \text{TNC} + \text{Shortfall amort charge} + \text{Waiver amort charge} \\ &= 5,066 + 0 + 0 \\ &= 5,066\end{aligned}$$

Answer is D

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Problem 11

Similar to 2013 #41

This problem is simpler than other similar problems on recent exams. This problem does not require knowledge of the special rule in the final 1.430 regulations regarding bringing forward the prefunding balance (PB) based on two different interest rates.

2014 Prefunding balance

The problem asks for the maximum value of the prefunding balance at 01/01/15. The problem states that there are no required quarterly installments for 2014, and the plan sponsor did not elect to use the PB to satisfy the minimum contribution requirement.

Excess contribution

You can calculate the amount of the excess contribution at 01/01/2014. You need to compare the present value of the contribution paid at 02/01/2015 to the MRC. The present value is calculated using the effective rate of interest for the 2014 plan year:

$$\begin{aligned}\text{PV of contrib} &= 150,000 * (1.06)^{-13/12} \\ &= 140,824\end{aligned}$$

$$\begin{aligned}\text{Addition to} \\ \text{2014 PB} &= 140,824 - 100,000 \text{ MRC} \\ &= 40,824 \text{ excess contribution}\end{aligned}$$

Since there was no PB used in 2014, the 01/2015 PB equals the sum of the 01/2014 PB (brought forward using the rate of return on assets for the 2014 plan year) plus the excess contribution (brought forward with the effective rate of interest for the 2014 plan year):

$$\begin{aligned}\text{01/2015 PB} &= 1.06(40,824 \text{ excess contribution}) + 1.10(25,000 \text{ PB}) \\ &= 70,773\end{aligned}$$

Answer is D

NOTE

You get a slightly different numerical result if you use simple interest. The resulting PV of the contribution is 140,805 and the 01/2015 PB is 70,754. As expected, this is in the same answer range.

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Problem 12 – Page 1

Similar to 2006 #17

The key point to the problem is calculating the Projected Unit Credit (PUC) accrued liability and the normal cost. 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 for the year.

$$AL = PV (FAB)$$

$$NC = PV (\Delta FAB)$$

The 1.412(c)(3)-1 regulation defines "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.

The plan benefit is based on the final year of pay. The normal retirement age is 65 (by default), so you need to project pay to age 64.

Valuation data

01/2015 Age 42

2014 pay (age 41) 78,000

$$\text{Projected pay @ 64} = 172,077 = 78,000 \cdot (1.035)^{23}$$

$$\begin{aligned} \Delta(\text{Funding Accrued benefit}) &= 2\% \cdot (\text{Final pay}) \\ &= 2\% \cdot 172,077 \\ &= 3,442 \end{aligned}$$

Change in interest rate

\$X is defined as the change in the normal cost solely due to a decrease in the interest rate from 7.5% to 7.0%:

$$\begin{aligned} \text{PUC NC} &= 3,442(D_{65} / D_{42}) \ddot{a}_{65}^{(12)} \\ \text{Old 7.5\% interest rate} &= 3,442(1.075)^{-23}(9.72) \\ &= 6,339 \\ \text{New 7.0\% interest rate} &= 3,442(1.070)^{-23}(10.11) \\ &= 7,340 \end{aligned}$$

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Problem 12 – Page 2

\$X is the change in the PUC normal cost due to the change in the interest rate. The value is 1,001 = 7,340 - 6,339.

Change in salary scale

\$Y is defined as the change in the normal cost solely due to a decrease in the salary scale rate from 3.5% to 3.0%. Now you need to recalculate the projected pay at age 64 based on the new salary scale:

$$\text{Projected pay @ 64} = 153,940 = 78,000 \cdot (1.030)^{23}$$

$$\begin{aligned} \Delta(\text{Funding Accrued benefit}) & \quad 2\% \cdot (\text{Final pay}) \\ & \quad 2\% \cdot 153,940 \\ & \quad = 3,079 \end{aligned}$$

$$\text{PUC NC} \quad \Delta(\text{FAB})(D_{65} / D_{42}) \ddot{a}_{65}^{(12)}$$

$$\begin{aligned} \text{Old 3.5\% salary scale} & \quad 3,442(1.075)^{-23}(9.72) \\ & \quad = 6,339 \end{aligned}$$

$$\begin{aligned} \text{New 3.0\% salary scale} & \quad 3,079(1.075)^{-23}(9.72) \\ & \quad = 5,671 \end{aligned}$$

\$Y is the change in the PUC normal cost due to the change in the salary scale. The value is -668 = 5,671 - 6,339. The question asks for the absolute value of \$X plus the absolute value of \$Y, which is 1,669 = 1,001 + 668.

Answer is D

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Problem 13 – Page 1

Similar to 2013 #52

The main point of the problem is correctly calculating the benefits for both the Funding target and the Target normal cost.

The plan benefit is based on the three year final average pay. You don't need to worry about the §401(a)(17) limit, since the pay values are not large enough. The problem states that the assumed pay increase is 10% per year. You don't know the participation date or the plan effective date, so you can't determine the 415 limits.

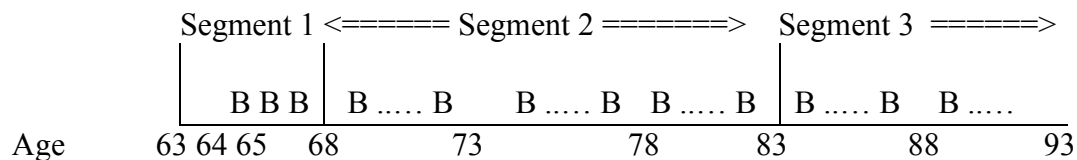
The first step is determining the pay that can be used to calculate Smith's accrued benefit. Since the problem asks for the Target normal cost, you must calculate the accrued benefit at both 01/01/2015 and 01/01/2016:

Valuation date	01/01/15	01/01/16
Age	63	65
Past service	3	4
Prior year's pay	200,000	$200,000 \times (1.10) = 220,000$
3 year average pay	$(100,000 + 150,000 + 200,000) / 3 = 150,000$	$(150,000 + 200,000 + 220,000) / 3 = 190,000$
Accrued benefit	$8\%(3)(150,000) = 36,000$	$8\%(4)(190,000) = 60,800$

$$\begin{aligned}\Delta AB &= 60,800 - 36,000 \\ &= 24,800\end{aligned}$$

Target Normal Cost

The Target normal cost is defined as the present value of the change in the accrued benefit. It is similar to the traditional Unit Credit normal cost. Based on the default exam conditions, normal retirement age is 65, and the benefit is assumed payable monthly, starting at normal retirement age. Since the participant is currently age 63, their benefit payments will be valued using all three segment rates:



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Problem 13 – Page 2

Now you need to express these annuities in terms of commutation functions. The problem states that Smith is a male employee. The commutation factors are based on the male factor tables given with the exam.

One complication is that there are no pre-retirement decrements. The period between age 63 and 65 must be calculated using an interest-only discount.

$${}_2|\ddot{a}_{63:\overline{3}|seg_1}^{(12)} = (1.05)^{-2}(N_{65}^{(12)} - N_{68}^{(12)}) / D_{65} \quad \text{all at segment 1 rate}$$

$${}_5|\ddot{a}_{63:\overline{15}|seg_2}^{(12)} = (1.06)^{-2}(N_{68}^{(12)} - N_{83}^{(12)}) / D_{65} \quad \text{all at segment 2 rate}$$

$${}_{20}|\ddot{a}_{63seg_3}^{(12)} = (1.07)^{-2} N_{83}^{(12)} / D_{65} \quad \text{all at segment 3 rate}$$

$$\begin{aligned} \text{Age 63 NC} &= 24,800 \left[\frac{(1.05)^{-2}(459,331 - 352,260)}{38,844} + \frac{(1.06)^{-2}(171,752 - 22,728)}{20,977} \right. \\ &\quad \left. + \frac{(1.07)^{-2}(10,037)}{11,394} \right] \\ &= 8,894[.9070*2.7564 + .8900*7.1042 + .8734*.8809] \\ &= 237,888 \end{aligned}$$

Answer is B

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Problem 14 – Page 1

Similar to 2010 #35

This problem asks for the accrued liability for Smith. The Unit Credit accrued liability is defined as the present value of the actual accrued benefit. The key to this problem is handling the multiple disability decrements correctly in calculating the Accrued liability as an active employee. The disability decrements in this problem should be handled in a similar manner as other problems with retirement decrements.

01/01/2015 data

Description

Age 63
Monthly accrued benefit 4,500

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

$$AL = \sum_{t=0}^1 v^t {}_t p_{63}^{(T)} q_{63+t}^{(i)} (\text{disability benefit})_{63+t} \ddot{a}_{63+t}^{(12)} + v^2 {}_2 p_{63}^{(T)} (\text{retirement benefit})_{65} \ddot{a}_{65}^{(12)}$$

For disability prior to age 65, the benefit is reduced 5% per year. Anyone who survives to age 65 is assumed to retire at 65.

$$\begin{aligned} \text{Disab ben}_{63} &= 12 * 4,500 [1 - 5\%(65 - 63)] \\ &= 48,600 \end{aligned}$$

$$\begin{aligned} \text{Disab ben}_{64} &= 12 * 4,500 [1 - 5\%(65 - 64)] \\ &= 51,300 \end{aligned}$$

$$\begin{aligned} \text{Retire ben}_{65} &= 12 * 4,500 \\ &= 54,000 \end{aligned}$$

Accrued Liability

Now you can calculate the Accrued Liability. One potential trick is that the post-disability annuity factors use different mortality.

	(1)	(2)	(3)		(4)	(5)	(6)	
t	<u>63+t</u>	<u>v^t</u>	<u>_tp^(T)₆₃</u>	<u>q⁽ⁱ⁾_{63+t}</u>	<u>p^(T)_{63+t}</u>	<u>Ben_{63+t}</u>	<u>$\ddot{a}^{(12)}_{63+t}$</u>	<u>(1)(2)(3)(4)(5)</u>
0	63	1.000	1.000	0.065	0.935	48,600	9.00	28,431
1	64	.9346	0.935	0.075	0.925	51,300	8.65	29,082
2	65	.8734	0.865	1.00	0.00	54,000	10.11	<u>412,411</u>
								469,924

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Problem 14 – Page 2

The column which shows the one year probability of survival is not used in the summation. But it is used to develop the value of column 2 at the next calculation age.

Answer is B

NOTE

There is a lot of arithmetic in this problem. One easy way to miss this question is to not be careful enough in calculating the probability of survival to each age.

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Problem 15

This problem is a very detailed one on revocation of a plan sponsor election to apply the carryover / prefunding balance towards the minimum required contribution (MRC).

I. TRUE

The plan sponsor elected to apply 200,000 of balances towards the MRC. Since the MRC is less than that amount, unless the election is changed, the balances will be reduced by the entire amount of 200,000. See the regulation at 1.430(f)-1(f)(3)(ii):

"If no such revocation is made, then, under paragraph (b) of this section, the funding standard carryover balance or prefunding balance is decreased by the entire amount that the plan sponsor elected to use to offset the minimum required contribution for a plan year (including an election to satisfy the quarterly contribution requirements for a plan year)."

II. TRUE

In order for the "excess election" to be revoked, written notice is required. See the regulation at 1.430(f)-1(f)(3)(ii).

III. FALSE

In order for the "excess election" to be revoked, written notice must be given before the end of the current plan year. See the regulation at 1.430(f)-1(f)(3)(iii):

"The deadline for revoking the election described in paragraph (f)(3)(ii) of this section is generally the end of the plan year. However, for plans with a valuation date other than the first day of the plan year, the deadline for the revocation is the deadline for contributions for the plan year as described in section 430(j)(1)."

Only items I and II are true.

Answer is A

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Problem 16

Similar to 2009 #29

In general, IRC 430(g)(3) requires that the actuarial value of assets (AAV) be equal to the market value. Plans may use an averaging method, but only if the resulting AAV is between 90% and 110% of market value.

Under IRC 430(g)(4), both values should be increased by the present value of any receivable contributions (as of the valuation date) for the prior plan year. The present value is calculated using the effective interest rate for the prior plan year.

$$\begin{aligned} 01/2015 \text{ AAV} &= 2,500,000 + 100,000(1.065)^{-(5.5/12)} + 300,000(1.065)^{-(7.5/12)} \\ &= 2,500,000 + 97,155 + 288,422 \\ &= 2,885,576 \end{aligned}$$

You do not need to check the 90% / 110% corridor in this problem. The value shown above is 100% of the market value of assets.

Answer is D

NOTES

1. Why is this question worth 3 points? It seems to be way too short!
2. You get a slightly different numerical result if you use simple interest to discount the receivable contributions. The resulting AAV is 2,885,395. As expected, this is in the same answer range.
3. IRS Notice 2009-22 clarifies calculation of the thresholds based on 90% and 110% of market value. The present value of the discounted contributions is added to the market value first. Then you apply the 90% and 110% factors.

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Problem 17

Similar to 2009 #39

Revised 09/12/16

The key to this problem is knowing just a little bit about cash balance plans. In addition, you must know how to calculate the Funding target under IRC Section 430.

The participant is assumed to retire at age 65, and receive a lump sum. The Funding target is the present value at 01/01/15 of the lump sum they would receive at age 65. This must be calculated using the interest crediting rate of 5.5% between current age and age 65:

Valuation date 01/01/2015

Age 62

Account balance 500,000

Age 65

Account balance 587,121
 = $500,000(1.055)^3$

There are three segment interest rates, but the benefit payments are discounted back to the valuation date using a single rate, based on which segment they fall into. The present value of the lump sum payment at 65 is calculated using the first segment rate of 4%:

$$\begin{aligned} \text{FT} &= \text{PV of AB} \\ &= 587,121(D_{65} / D_{62}) \\ &= 587,121(1+i)^{-3}({}_3p_{62}) \\ &= 587,121(1.04)^{-3}(1.0) \\ &= 521,948 \end{aligned}$$

Answer is C

NOTE

This is another question that seems way too short!

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Problem 18 – Page 1

Similar to 2011 #15

The key to this problem is the determination of the Funding target under IRC Section 430(i). This plan has a funding standard carryover balance (CB) of zero, based on 2014 exam condition 30. The plan has a prefunding balance (PB) of 400,000 at 01/01/2015.

At-Risk Determination

The problem gives you 2015 valuation data related to the At-Risk values for the Funding target. The problem has one simplification - it states that the plan was in At-Risk status for 2012, 2014 and 2015, so you can skip the At-Risk determination.

At-Risk plan - Load factors

IRC 430(i)(1)(A) defines the load factors that are used in calculating the Funding target and the Target normal cost on an At-Risk basis. The Funding target equals the sum of

- PV of all benefits accrued or earned under the plan
 - As of the beginning of the plan year
 - Using assumptions in 430(i)(1)(B), plus
- For plans in At-risk status for at least 2 of the 4 preceding plan years, a loading factor of \$700 per participant, plus 4% of the Funding target, ignoring 430(i) rules

2014 exam condition 46 defines terms related to At-Risk plans:

The terms “at-risk funding target” and “at-risk target normal cost” mean the funding target and target normal cost calculated reflecting additional actuarial assumptions and loading factors (if applicable) for a plan in at-risk status prior to the application of any five-year transition as described in IRC section 430(i)(5).

This problem does not give you the “at-risk funding target”. Instead you are given the funding target ignoring the At-Risk rules, as well as the “at-risk funding target disregarding 5-year transition and loads”. I interpret this as the funding target reflecting the At-Risk assumptions only - you still must apply the 5-year transition and load factor.

The plan is in At-Risk status for two consecutive years (2014 and 2015), and two of the prior four years (2012 and 2014). As a result, both of the additional load factors should be applied:

Funding target using 430(i)(1)(B) assump	17,700,000
4% load	612,000 = 4%*15,300,000
Per participant load	<u>791,000</u> = 700*1,130
At-Risk Funding target	19,103,000

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At-Risk plan - Weighting factors

The next step in the problem is determining the “final” value of the At-Risk Funding target (and the target normal cost). IRC 430(i)(5) defines weighting factors that are used in calculating the “final values” of the Funding target and the Target normal cost on an At-Risk basis:

Consecutive years plan has been in at-risk status	Percent of item based on 430(i) rules	Percent of item ignoring 430(i) rules
1	20%	80%
2	40%	60%
3	60%	40%
4	80%	20%
5	100%	zero

The “Final” At-Risk value will equal the sum of 2*20% times the At-Risk value (including any load factors) and (1-2*20%) times the non-At-Risk value:

$$\begin{aligned}\text{A-R Funding Target} &= 40\%*(19,103,000) + 60\%*(15,300,000) \\ &= 16,821,200\end{aligned}$$

The remainder of this problem is a typical IRC 430 calculation of the shortfall amortization installment.

Funding Shortfall

The problem asks for \$X, which is the absolute value of the 2015 shortfall amortization installment. The first step is calculation of the funding shortfall. If this amount is zero, then the definition of the minimum required contribution (MRC) will be different:

$$\begin{aligned}\text{Funding S/F} &= \text{Funding target} - (\text{AAV} - \text{CB} - \text{PB}) \\ &= 16,821,200 - (16,500,000 - 0 - 400,000) \\ &= 721,200\end{aligned}$$

Shortfall Base Exemption

You do not need to think too much about whether this plan satisfies the shortfall base exemption. The transition rule for the applicable percentage expired at the end of the 2010 plan year. The modified funding shortfall is identical to the previously calculated Funding shortfall:

$$\begin{aligned}\text{Modified S/F} &= 100\%*(\text{Funding target}) - (\text{AAV} - \text{PB}) \\ &= \text{NOT zero}\end{aligned}$$

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Problem 18 – Page 3

Shortfall amortization installment

The plan is not eligible for the shortfall base exemption. You have to set up the 2015 shortfall amortization base, which is equal to

1. 100% times the Funding target
2. Minus the Actuarial asset value reduced by both CB and PB
3. Minus the present value of prior years' shortfall and waiver amortization installments:

$$\text{S/F Amort base} = 100\% * (\text{Funding target}) - (\text{AAV} - \text{CB} - \text{PB}) - (\text{PV of PY Amortizations})$$

This problem gives you the 01/01/2015 outstanding balances of all prior shortfall amortization installments as 1,168,738.

$$\begin{aligned}\text{S/F Amort base} &= 1.0 * 16,821,200 - (16,500,000 - 0 - 400,000) - (\text{PV of PY Amortizations}) \\ &= 721,200 - 1,168,738 \\ &= -447,538\end{aligned}$$

You must calculate the shortfall amortization installment for 2015. You can use the 7 year annuity factor from the lookup tables given with the exam:

$$\begin{aligned}\text{S/F amort} &= -447,538 / 5.9982 \\ &= -74,612\end{aligned}$$

The value of \$X is 74,612.

Answer is C

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Problem 19

TRUE

Based on the 1.430(h) regulation, plans with less than 500 participants have the option to use a combined mortality table (for both annuitants and non-annuitants). This option is only available for plans that use static mortality tables (not generational mortality tables).

See 1.430(h)(3)-1(b)(2).

Answer is A

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Problem 20 – Page 1

The key point to the problem is calculating the Projected Unit Credit (PUC) accrued liability. 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 for the year.

$$AL = PV (FAB)$$

$$NC = PV (\Delta FAB)$$

The 1.412(c)(3)-1 regulation defines "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.

01/2015 data

Name	<u>Smith</u>	<u>Jones</u>
Age	67	55
Service	15	7
2012 pay	40,000	62,000
2013 pay	49,000	65,000
2014 pay	52,000	68,000

The service for Smith is calculated from the 01/01/2000 hire date up to 01/01/2015. This is a bit unusual, since Smith is over age 65. The plan's late retirement benefit is defined as continued benefit accruals, with no actuarial increases. The problem states that the plan does provide suspension of benefits notices. This is one of the concepts from the spring exam, which covers the rules in IRC 411.

The plan benefit is based on the final three year average pay. The normal retirement age is 65 (by default), so you need to project pay to age 64. Since Smith is over age 65, their assumed retirement age is 67. You can calculate Smith's current three year average pay, but you need to use projected pay for Jones.

$$\begin{aligned}\text{Smith FAE3} &= (40,000 + 49,000 + 52,000)/3 \\ &= 47,000\end{aligned}$$

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Problem 20 – Page 2

$$\begin{aligned} \text{Jones' projected pay @ 64} &= 68,000 \cdot (1.025)^{10} && \text{(the 2014 pay is at age 54)} \\ &= 87,046 \end{aligned}$$

$$\begin{aligned} \text{Jones' FAE3} &= 87,046 \cdot (\ddot{a}_{\overline{3}|2.5\%} / 3) \\ &= 84,940 \end{aligned}$$

01/2015 valuation	<u>Smith</u>	<u>Jones</u>
Age	67	55
Service	15	7
Projected FAE3	47,000	84,940
Funding accd ben	$1.25\%(15)(47,000)$ $= 8,813$	$1.25\%(7)(84,940)$ $= 7,432$
PUC AL	$8,813 \ddot{a}_{67}^{(12)}$ $= 8,813(11.18)$ $= 98,524$	$7,432(D_{65} / D_{55}) \ddot{a}_{55}^{(12)}$ $7,432(1.05)^{-10}(11.83)$ $= 53,977$

The total accrued liability is $152,501 = 98,524 + 53,977$.

Answer is B

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Problem 21 – Page 1

Similar to 2011 #39

This is a simplified question on the quarterly contribution requirement. The key point of this question is that you must know how to discount the payments made back to the valuation date (and how to reflect the penalty interest rate).

The problem states that the 2015 minimum required contribution (MRC) is 820,000 and the required quarterly installment is 150,000. The effective interest rate (EIR) is 5%.

Calculate 09/15/2016 required contribution

The problem gives you several contributions at different dates. Some of the required quarterly installments are paid on a timely basis, and some are not.

<u>Due date</u>	<u>Required Installment</u>	<u>Amount Available</u>	<u>OVER (UNDER)</u>
04/15/2015	150,000	0	(150,000)
07/15/2015	150,000	300,000	0
10/15/2015	150,000	150,000	0
01/15/2016	150,000	150,000	0
09/15/2016		X	0

There is no contribution at 04/15/2015, which results in an underpayment of 150,000. There is a contribution of 300,000 at 07/15/2015, which is sufficient to eliminate the underpayment of 150,000.

To determine the value of X, you need to discount all of the contributions paid back to 01/01/2015. The difference between the discounted values and the 820,000 MRC is the amount of the contribution, assuming payment at the valuation date. From this point forward, the solution has some messy arithmetic.

The key idea of the problem is that the 2015 plan year contributions are normally discounted back to the valuation date using the 2015 effective interest rate (EIR). During any time period for which there is an underpayment of the required quarterly installments, the interest rate used for discounting is increased by 5%.

<u>Due date</u>	<u>Required Installment</u>	<u>Amount Available</u>	<u>OVER (UNDER)</u>	<u>months</u>	<u>Present value</u>
04/15/2015	150,000	0	(150,000)	3.5	
07/15/2015	150,000	300,000	0	6.5	$150,000(1.10)^{-3/12}(1.05)^{-3.5/12} +$ $150,000(1.05)^{-6.5/12}$
10/15/2015	150,000	150,000	0	9.5	$150,000(1.05)^{-9.5/12}$
01/15/2016	150,000	150,000	0	12.5	$150,000(1.05)^{-12.5/12}$
09/15/2016		X	0	20.5	$X(1.05)^{-20.5/12}$

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Problem 21 – Page 2

The tricky part of this calculation is the present value of the underpayment. The 04/15/15 underpayment is eliminated by the contribution at 07/15/15. The period of underpayment is 3 months. The underpayment must be discounted for the period of underpayment using the penalty rate ($10.0\% = 5.0\% + 5.0\%$). It must be discounted for the rest of the period back to 01/01/15 (3.5 months) at the effective rate of 5.0%.

The remaining contributions are discounted using only the EIR of 5.0%. Here is the calculation of the present value of the contributions for 2015, which is equal to the MRC of 820,000:

$$820,000 = 150,000\{(1.10)^{-3/12}(1.05)^{-3.5/12} + (1.05)^{-6.5/12} + (1.05)^{-9.5/12} + (1.05)^{-12.5/12}\} + X(1.05)^{-20.5/12}$$

$$= 150,000\{.9627 + .9739 + .9621 + .9504\} + .9200X$$

$$\begin{aligned} X &= (820,000 - 577,370) / .9200 \\ &= 263,720 \end{aligned}$$

Answer is D

NOTE

You can also work the problem using simple interest, even though it may be more confusing to set it up. As expected, this produces a result in the same answer range.

$$820,000 = 150,000\{[1+10\%(3/12)]^{-1}[1+5\%(3.5/12)]^{-1} + [1+5\%(6.5/12)]^{-1} + [1+5\%(9.5/12)]^{-1} + (1.05)^{-1}[1+5\%(5/12)]^{-1}\} + X\{(1.05)^{-1}[1+5\%(8.5/12)]^{-1}\}$$

$$= 150,000\{.9621 + .9736 + .9619 + .9504\} + .9198X$$

$$\begin{aligned} X &= (820,000 - 577,213) / .9198 \\ &= 263,958 \end{aligned}$$

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Problem 22 – Page 1

Similar to 2011 #22

Revised 09/07/18

The IRS released Notice 2009-22 in March 2009. It includes two detailed examples of the asset valuation method in IRC 430(g)(3), which include determination of the adjustment for expected earnings. The first example is very similar to the one in the 1.430(g)-1 proposed regulation. It is essentially a three year average market value calculation. The second example shows calculation of the average market value over the four prior quarters of the plan year.

There are two calculation techniques shown for the first example in Notice 2009-22. The first one requires calculation of the adjusted cash flows, which are used to adjust market values from prior dates up to the valuation date. Then the average market value is calculated. The final actuarial value of assets must be limited to be within 10% of the market value.

The second calculation method in Notice 2009-22 is based on the technique shown in Revenue Procedure 2000-40. The actuarial value of assets is calculated using decreasing fractions of each of the prior year's gain or loss. The alternate calculation is shown at the end of this solution.

This problem states the AAV uses the average market value over one year. The first step is calculation of the adjusted cash flows, which are used to adjust market values from prior dates up to the valuation date.

You must calculate the expected return on assets for 2014. The problem states that the actuary's assumed annual rate of return on assets is 6.50%. As described in Notice 2009-22, you must limit the assumed return on assets so it does not exceed the third segment rate at each valuation date. This has no effect, so the assumed rate of return is not limited, and remains 6.50%.

Based on the 6.50% assumed return, you can calculate the expected return on assets for 2014. The calculation must allow for the timing of the cash flows during the year.

Expected return calculation	6.50%
Plan year	2014
Beginning of year values	
Market value at 1-1	250,000
Contribution paid 01/02/2014	20,000
Middle of year values	
Benefit pmt + expenses	(24,000)
Expected return (compound)	16,782

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Problem 22 – Page 2

Revised 09/07/18

Now you can calculate the cash flow adjustment for 2014. This is the sum of the cash flows and the expected return.

Adjustment for year

Year	2014
Trust assets at 1-1	250,000
Market value at 1-1	250,000
Receivable contribution paid 09/01/15	9,604
Benefit payments	(20,000)
Expenses	(4,000)
Contribution paid 01/02/2014	20,000
Expected return (compound)	<u>16,782</u>
Adjustment for year	22,386

The 2015 market value excluding receivables was given in the problem as 328,000. You must include the discounted value of the 2014 receivable contribution, using the 2014 effective interest rate of 6.25%. The total market value is $337,604 = 328,000 + 9,604$.

Now you can calculate the adjusted market values. Each prior year's market value must be increased to reflect cash flows and expected interest from the date the market value is determined up to 01/01/2015:

Average market value calculation

Year	2014	2015
Market value at 1-1	250,000	337,604
Adjustment for 2014	<u>22,386</u>	
Adjusted fair market value	272,386	337,604

The preliminary actuarial asset value (AAV) is the average of the two adjusted market values:

$$304,995 = (272,386 + 337,604) / 2.$$

This preliminary actuarial asset value of 304,995 must be compared to the corridors. The final AAV must be limited to be within 10% of the market value.

The bottom of the corridor is 90% of market value, or 303,844. The final actuarial value of assets is not affected by the corridor, and remains 304,995.

Answer is C

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Problem 22 – Page 3

NOTE

There is an alternative solution for this problem. You can use an asset valuation technique from Revenue Ruling 2000-40 (pre-PPA 2006), and produce exactly the same AAV.

Method 15 - Smoothed market value without phase-in

The actuarial value of assets equals the market value less a decreasing fraction (i.e., $[n-1]/n$, $[n-2]/n$, etc. where n is the number of years in smoothing period) of the G/L for each of the prior $n-1$ years. The G/L is defined as the difference between the expected value and market value of assets at the valuation date. The expected value is calculated by bringing forward all cash flows with interest at the valuation rate up to this year's valuation date. If the expected value is less than the market value, the difference is a gain (and vice versa).

The actuarial value of assets is calculated using decreasing fractions of each of the prior years' gain or loss. The problem states that the averaging period is 2 years. With a two year average, the fraction is $1/2$:

$$01/2015 \text{ AAV} = 01/2015 \text{ MVA} - 1/2(2014 \text{ G/L})$$

You need to calculate the value of the G/L for 2014. This is the difference between the expected value (previously calculated) and the actual market value given.

The first thing you need to calculate is the expected MVA each year. The calculation uses the same numbers as the adjustment for the year. The 12/31 expected MVA equals the sum of the 01/01 MVA and the adjustment for the year:

$$\begin{aligned} 01/2015 \text{ } e\text{MVA} &= 01/2014 \text{ MVA} + \text{adjustment for 2014} \\ &= 250,000 + 22,386 \\ &= 272,386 \end{aligned}$$

$$\begin{aligned} 2014 \text{ G/L} &= 01/2015 \text{ MVA} - 01/2015 \text{ } e\text{MVA} \\ &= 337,604 - 272,386 \\ &= 65,218 \quad (\text{Gain}) \end{aligned}$$

$$\begin{aligned} 01/2015 \text{ AAV} &= 01/2015 \text{ MVA} - 1/2(2014 \text{ G/L}) \\ &= 337,604 - (1/2)(65,218) \\ &= 304,995 \end{aligned}$$

This preliminary actuarial asset value of 304,995 must be compared to the corridors. The final actuarial value of assets is not affected by the corridor, and remains 304,995.

This is identical to the earlier result calculated using the method in Notice 2009-22.

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Problem 23

FALSE

IRC Section 430(b)(1) defines the Target normal cost as the excess of (A) over (B):

- (A) the sum of the present value of benefits expected to accrue during the plan year plus the plan-related expenses expected to be paid from the assets during the plan year
- (B) the amount of mandatory employee contributions expected to be made during the plan year

Since this plan does have mandatory employee contributions, the Target normal cost can be less than the present value of benefits expected to accrue during the plan year.

Answer is B

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Problem 24

TRUE

This is a requirement in IRC Section 430(f)(3)(B):

(B) Coordination with funding standard carryover balance

To the extent that any plan has a funding standard carryover balance greater than zero, no amount of the prefunding balance of such plan may be credited under this paragraph in reducing the minimum required contribution.

Answer is A

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Problem 25

TRUE

In general, all plans have a choice whether to use the static mortality tables or the generational mortality tables. The only time plan size matters is for the option to use the combined mortality table (for both annuitants and non-annuitants). This was the topic of question 19 on the 2014 exam.

Answer is A

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Problem 26 – Page 1

The key to this problem is calculating the amount of the shortfall amortization installments in 2011. In addition, you need to determine the impact of the installment acceleration amount on the shortfall amortization installments for 2014 and later.

2011 Shortfall amortization installment

This problem gives you the 2011 shortfall amortization base as 55,000. You need to amortize the funding shortfall base over fifteen years, using the first two segment interest rates for 2011:

$$\begin{aligned} 10.3758 &= \ddot{a}_{\overline{5}|.05} + (\ddot{a}_{\overline{15}|.060} - \ddot{a}_{\overline{5}|.060}) \\ &= \underbrace{1 + v^1 + v^2 + v^3 + v^4}_{\text{using 5.00\%}} + \underbrace{v^5 + \dots + v^{14}}_{\text{using 6.00\%}} \end{aligned}$$

$$\begin{aligned} \text{2011 amort} &= 55,000 / 10.3762 \\ &= 5,301 \end{aligned}$$

Extraordinary dividend and redemption payments - 2014

The problem gives you the value of "extraordinary dividend and redemption payments" as 17,500 for the 2014 year. The relationship between those amounts and the shortfall amortization acceleration amount is complicated.

Section 430(c)(7)(E) defines the excess shareholder payment amount that is included in the installment acceleration amount. The excess shareholder payment amount for a plan year is the excess (if any) of the sum of dividends declared during the plan year by the plan sponsor plus the aggregate amount paid for the redemption of stock of the plan sponsor redeemed during the plan year (given as 17,500), over the greater of two amounts.

The first such amount is the adjusted net income (within the meaning of section 4043 of ERISA) of the plan sponsor for the preceding plan year, determined without regard to any reduction by reason of interest, taxes, depreciation, or amortization. The second such amount is, in the case of a plan sponsor that determined and declared dividends in the same manner for at least 5 consecutive years immediately preceding such plan year, the aggregate amount of dividends determined and declared for such plan year using such manner.

This problem was strangely silent about the plan sponsor's adjusted net income. This was probably an intentional simplification by the person who created this exam question. With no additional information on the "other two amounts", the shortfall amortization acceleration amount is equal to 17,500.

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Problem 26 – Page 2

Shortfall amortization acceleration amount - 2014

The question asks for \$X, which is the shortfall amortization installment for 2015. But you actually have to begin by looking at the 2014 plan year. The reason is that the installment acceleration amount may affect the shortfall amortization installment for 2014, which can also impact 2015.

For any plan year within the restriction period (Notice 2011-3 Q&A I-2) an installment acceleration amount is calculated for any shortfall base for which an alternative amortization schedule has been elected. The installment acceleration amount is the sum of the “excess compensation amount” and the “excess shareholder payment amount”.

Installment acceleration amounts do not increase the total amount of installment payments made for a shortfall amortization base. Instead, they only accelerate the timing of shortfall amortization installments. This requires a recalculation of future shortfall amortization installments.

Restriction period

The first thing to check is that the 2015 plan year falls within the restriction period. If it does not, then the installment acceleration amount will not change the shortfall amortization installments.

The plan sponsor elected to use the 15-year amortization schedule for 2011. The restriction period with respect to that election year is the 5-year period beginning with the later of

- the election year or
- the first plan year beginning after December 31, 2009.

The 2015 plan year does fall within the 5-year period starting with the 2011 plan year. Now you need to determine the effect of the installment acceleration amount for the 2015 plan year.

Shortfall amortization acceleration amount - Limitation for 2014

As described above, the shortfall amortization acceleration amount is equal to 17,500. In the absence of the limitation on the acceleration amount, you would simply add this to the shortfall amortization installment.

At the end of the plan year for which a shortfall amortization installment for a shortfall amortization base is increased, the cumulative amount of the shortfall amortization installments for that base (including any increase due to installment acceleration amounts) can not exceed the cumulative amount of the shortfall amortization installments for that base determined as if the alternative amortization schedule had not been elected.

The annual limitation on the increase in the shortfall amortization installment is determined for a shortfall amortization base as the excess of

- (i) the sum (without interest) of the shortfall amortization installments for the plan year and all preceding plan years, determined as if the sponsor had not elected the alternative amortization schedule, over
- (ii) the sum (without interest) of the actual shortfall amortization installments for the plan year and all preceding plan years, reflecting the alternative amortization schedule elected by the plan sponsor. This amount ignores the acceleration adjustment for the current plan year.

2011 Shortfall amortization installment over 7 years

To test the limitation, you must determine the amortization installment assuming the plan sponsor did not elect the alternate amortization schedule. You need to amortize the 2011 funding shortfall base over seven years, using the first two segment interest rates for 2011:

$$\begin{aligned}
 5.9982 &= \ddot{a}_{\overline{5}|.05} + (\ddot{a}_{\overline{7}|.060} - \ddot{a}_{\overline{5}|.060}) \\
 &= \underbrace{1 + v^1 + v^2 + v^3 + v^4}_{\text{using 5.00\%}} + \underbrace{v^5 + v^6}_{\text{using 6.00\%}}
 \end{aligned}$$

$$\begin{aligned}
 \text{2011 amort} &= 55,000 / 5.9982 \\
 &= 9,169
 \end{aligned}$$

Shortfall amortization acceleration amount - 2014 Limitation

The limitation is calculated as the sum (from 2011 through 2014) of the excess of the original shortfall amortization installment of 9,169 over the alternate shortfall amortization installment of 5,301:

Year	Original S/F amortization Installment	Alternate S/F amortization Installment
2011	9,169	5,301
2012	9,169	5,301
2013	9,169	5,301
2014	9,169	5,301
Total	36,677	21,202

$$\begin{aligned}
 \text{Limitation} &= 36,677 - 21,202 \\
 &= 15,475
 \end{aligned}$$

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Problem 26 – Page 4

Since the shortfall amortization acceleration amount of 17,500 is larger, the limitation does apply. The 2014 shortfall amortization installment is only increased to 20,776, which equals $15,475 + 5,301$.

Shortfall amortization acceleration amount - 2015 Limitation

The difference between the 2014 installment acceleration amount of 17,500 and the limitation of 15,475 (which equals 2,025) must be carried forward to the next year. This is done because 2015 falls within the carryover period defined in IRS Notice 2011-3.

The limitation is calculated as the sum (from 2011 through 2015) of the excess of the original shortfall amortization installment of 9,169 over the alternate shortfall amortization installment of 5,301. This includes the acceleration adjustment for 2014:

Year	Original S/F amortization Installment	Alternate S/F amortization Installment
2011	9,169	5,301
2012	9,169	5,301
2013	9,169	5,301
2014	9,169	$15,475 + 5,301$
2015	9,169	5,301
Total	45,847	41,978

$$\begin{aligned}\text{Limitation} &= 45,847 - 41,978 \\ &= 3,869\end{aligned}$$

The limitation on the acceleration amount does not apply for 2015. The reason is that the limitation exceeds the installment acceleration amount of 2,025 carried forward from 2014.

The 2015 shortfall amortization installment is increased to 7,326, which equals $2,025 + 5,301$.

Answer is C

NOTES

1. Thank goodness this was only a three point problem. I assume most students probably skipped this one.

(notes continued on next page)

Problem 26 – Page 5

NOTES - continued

2. For a plan sponsor that elects to use the 15-year amortization schedule for a plan year, no excess installment acceleration amount is carried over to a plan year which begins after the second plan year following the last plan year in the restriction period for that base. As previously described, the restriction period starts in 2011 and ends in 2015. The carryover period ends in 2017.
3. Luckily this problem did not ask for the final shortfall amortization installment for the base established in 2011. Those calculations get quite complicated.

When an amount is added to the shortfall amortization installment for a plan year, the remaining shortfall amortization installments are reduced. The result is that the present value of the future shortfall amortization installments is the same as before reflecting the installment acceleration amount.

Under § 430(c)(7)(B)(ii), these reductions in installments are applied in reverse order, beginning with the last shortfall amortization installment due for the shortfall amortization base. The present value of the remaining payments is determined using the segment rates used to determine the target normal cost (or funding target) for the year for which the acceleration adjustment is added to the shortfall amortization installment.

If you want to see an example of this calculation, you are in luck. I created a practice problem on this idea a few years ago - see 430(c) practice problem 5.

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Problem 27

TRUE

Under IRC §431(d)(1)(B), the plan sponsor has met all the requirements for automatic extension of the amortization periods for the amortization charge bases:

- No applications for extensions accepted after 12/31/2014
- Without extension, expect funding deficiency in current or next 9 plan years
- Sponsor adopted funding improvement plan
- Plan will have sufficient assets to pay benefits plus expenditures over extension period
- Sponsor has provided advance notice to participants under 431(d)(3)

Answer is A

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Problem 28

Similar to 2012 #19

The 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.

You need to calculate the Unit Credit accrued liability at 01/01/2015. The accrued liability is defined as the present value of the accrued benefit.

Retired AL = PV of Early retirement benefit

Active AL = PV of Accrued benefit

Retired PVB calculations

01-01-15 Age 63

Past service 21

Accrued benefit $12 * 21 * 60 = 15,120$

Early retirement reduction factor $1 - (65 - 63)(3\%) = .94$

Early retirement benefit $.94(15,120) = 14,213$

$$\ddot{a}_{63}^{(12)} = N_{63}^{(12)} / D_{63}$$

Retirement annuity $= 273,822 / 23,948 = 11.4340$

PVB as retiree $14,213 * (11.4340) = 162,509$

You are told that Smith is a male employee. The commutation factors are based on the male factor tables given with the exam.

Active AL calculations

01-01-15 Age 63

Accrued benefit 15,120

$$\ddot{a}_{65}^{(12)} = N_{65}^{(12)} / D_{65}$$

Retirement annuity $= 228,812 / 20,977 = 10.9078$

Accrued liability $15,120(1.06)^{-2} \ddot{a}_{65}^{(12)} = 146,783$

Since the PVB as a retiree is greater, there is a loss at Smith's retirement of $15,727 = 162,509 - 146,783$.

Answer is C

This asset valuation question has rarely been asked for a multiemployer plan since PPA was passed. This is such an old topic that this is essentially a trick question! These calculations are almost identical to those for some recent questions on single employer plans.

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. The final actuarial value of assets can't be lower than 80% of market value. The final actuarial value of assets can't be greater than 120% of market value. The final test ensures that the resulting AAV falls between 80% and 120% of the market value.

(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 years' gain or loss. With a five year average, the fractions are $\frac{4}{5}$, $\frac{3}{5}$, $\frac{2}{5}$, and $\frac{1}{5}$. 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 $\frac{1}{3}$.

You are given the 2013 G/L item, and you need to calculate the 2014 G/L item. To do this, you need to calculate the expected market value of assets at 01/01/15.

Problem 29 – Page 2

Revised 09/07/18

01/01/15 Asset calculations - simple interest

$$\begin{aligned} 01/15 \text{ } _e\text{MVA} &= (1.07) * 50,000 - [1 + .07(6/12)] * 1,500 + [1 + .07(2/12)] * 5,000 \\ &= 57,006 \end{aligned}$$

$$\begin{aligned} \text{MVA G/L} &= 01/15 \text{ MVA} - 01/15 \text{ } _e\text{MVA} \\ &= 40,000 - 57,006 \\ &= -17,006 \quad (\text{Loss}) \end{aligned}$$

Preliminary

$$\begin{aligned} 01/15 \text{ AAV} &= 01/15 \text{ MVA} - 2/3(2014 \text{ G/L}) - 1/3(2013 \text{ G/L}) \\ &= 40,000 - (2/3)(-17,006) - (1/3)(3,000) \\ &= 50,337 \end{aligned}$$

This preliminary actuarial asset value of 50,337 must be compared to the corridors. The final AAV must be limited to be within 20% of the market value.

$$\begin{aligned} 01/15 \text{ AAV} &= \text{Lesser of } [1.20(40,000) \text{ and greater of } (50,337 \text{ or } .80(40,000))] \\ &= 48,000 \end{aligned}$$

The corridor caps the AAV at 120% of the MVA.

Answer is D

NOTES:

1. In the calculation of the AAV above, asset gains are treated as positive numbers, and asset losses are treated as negative numbers. Of course this does not match the signs for the asset gains and losses given in the problem.
2. If you used compound interest to calculate the expected market value, the MVA at 01/2015 and the G/L value for 2014 are slightly different. As expected, the final value falls in the same answer range.

$$\begin{aligned} 01/15 \text{ } _e\text{MVA} &= 57,005 \\ 2014 \text{ G/L} &= 17,005 \\ 01/15 \text{ AAV} &= 48,000 \quad (\text{corridor does apply}) \end{aligned}$$

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Problem 30 – Page 1

Similar to 2009 #15

Revised 10/19/16

One key to this problem is the calculation of the deductible limit under IRC 404(o). You need to know the definition of the cushion amount.

The main point of the question is that you are given two sets of segment rates. The second set is vaguely defined as the "Adjusted segment rates". Since these are higher rates, they must be the MAP-21 rates. In MAP-21, it clearly states that the 404(o) deductible limit is not determined using these adjusted rates. It makes sense, since the higher segment rates produce a lower deductible limit.

Deductible Limit

The deductible limit is defined as the greater of the minimum contribution required under IRC 430 and the amount under 404(o)(2). IRC 430 defines "the minimum required contribution" as the amount prior to reduction by the carryover balance or the prefunding balance. You don't have enough information to calculate the shortfall amortization installment in this problem, so you should ignore the minimum contribution.

The maximum deductible limit is defined under 404(o)(2)(A):
Target normal cost + Funding target + Cushion amount - Actuarial asset value

Cushion amount

The Cushion amount is defined as the sum of two pieces:

- (1) 50% of the Funding target, and
- (2) the increase in the Funding target due to allowing for future pay increases.

You can think of the second item as the excess of the Projected Unit Credit accrued liability over the Traditional Unit Credit accrued liability.

Valuation calculations

You need to calculate the Funding target and the Target normal cost at 01/01/2015. These items are the Unit Credit accrued liability and the Unit Credit normal cost, respectively. In addition, you need to calculate the Projected Unit Credit accrued liability for the cushion amount.

The first step is to determine the accrued benefit at the valuation date, and the benefit accrual during 2015. It is unusual that there is no salary increase during 2015 (zero salary scale):

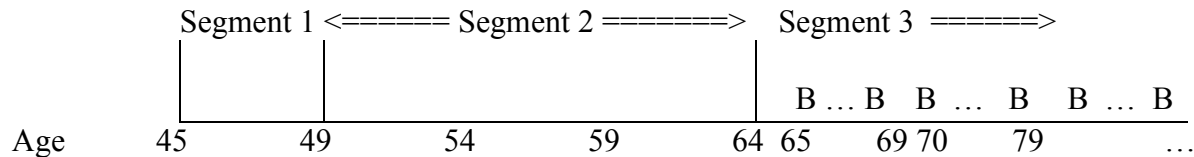
Valuation date	01/01/2015	01/01/2016
Age	45	46
Past service	3	4
Prior year pay	175,000	175,000*1.0
Three year average pay	$(100,000 + 150,000 + 175,000)/3$ = 141,667	$(150,000 + 175,000 + 175,000)/3$ = 166,667
Accrued benefit	$10\%(3)(141,667)$ = 42,500	$10\%(4)(166,667)$ = 66,667

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Problem 30 – Page 2

$$\begin{aligned}\Delta AB &= 66,667 - 42,500 \\ &= 24,167\end{aligned}$$

There are three segment interest rates, but each benefit payment is discounted back to the valuation date using a single rate, based on which segment they fall into. The participant is currently 20 years from retirement, so their benefit payments will be valued using the third segment rate of 5.5%.



$$\begin{aligned}\text{NC} &= \text{PV of } (\Delta AB) = \text{Target normal cost} \\ &= 24,167(D_{65} / D_{45}) \ddot{a}_{65}^{(12)} \\ &= 24,167(1+i)^{-20}({}_{20}p_{45}) \ddot{a}_{65}^{(12)} \\ &= 24,167(1.055)^{-20}(11.35) \\ &= 94,008\end{aligned}$$

With no pre-retirement decrements, the D/D terms are only based on the 5.5% interest rate.

$$\begin{aligned}\text{AL} &= \text{PV of AB} = \text{Funding target} \\ &= 42,500(D_{65} / D_{45}) \ddot{a}_{65}^{(12)} \\ &= 42,500(1.055)^{-20}(11.35) \\ &= 165,324\end{aligned}$$

To determine the cushion amount, you need to calculate the PUC accrued liability at 01/01/2015. Under PUC, the accrued liability is defined as the present value of the “funding accrued benefit” (FAB):

$$\text{PUC AL} = \text{PV (FAB)}$$

The 1.412(c)(3)-1 regulation defines "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.

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Problem 30 – Page 3

Revised 10/19/16

$$\begin{aligned}\text{Valuation pay at age 45} &= 175,000 \\ \text{Projected pay at age 64} &= 175,000 \cdot (1.0)^{19}\end{aligned}$$

$$\begin{aligned}\text{Funding accrued benefit} &= 10\%(3.0)(175,000) \\ &= 52,500\end{aligned}$$

It seems strange, but the projected final average pay is the same as the current pay (due to the salary scale of zero). This is probably another minor point of the problem - that the cushion amount is based on a different compensation value.

$$\begin{aligned}\text{PUC AL} &= 52,500(D_{65} / D_{45}) \ddot{a}_{65}^{(12)} \\ &= 52,500(1.055)^{-20}(11.35) \\ &= 204,224\end{aligned}$$

$$\begin{aligned}\text{Cushion amount} &= 50\%(\text{Funding target}) + (\text{PUC AL} - \text{Funding target}) \\ &= \text{PUC AL} - 50\%(\text{Funding target}) \\ &= 204,224 - (.50)(165,324) \\ &= 121,562\end{aligned}$$

Now you can calculate the deductible limit:

Target normal cost	94,008
+ Funding target	165,324
+ Cushion amount	121,562
Sub-total	380,893
Less unreduced AAV	200,000
Deductible limit	180,893

The final deductible limit is 180,893.

Answer is E

NOTE

For plans that are not At-Risk, there is an alternative definition of the deductible limit in 404(o)(2)(B):

“Final” At-Risk Target normal cost + “Final” At-Risk Funding target - Actuarial asset value

If this plan had some type of subsidized early retirement benefit, or optional forms of payment, then you would need to calculate the At-Risk values of the Funding target and the Target normal cost. Since there is no early retirement benefit, or optional forms of payment, the At-Risk values are the same as the non-At-risk values. The value of the alternative deductible limit assuming the plan is At-Risk will be lower than the value calculated above (by the cushion amount).

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Problem 31

This is a fairly simple problem on amortization of waiver bases. Based on 2014 exam condition 51, you should assume this is a single employer plan.

I. TRUE

See IRC 430(e)(1).

II. FALSE

Waivers are amortized using the first two segment rates for the prior year. See the regulation at 1.430(a)-1(d)(1).

III. TRUE

See IRC 430(e)(5).

Only items I and III are true.

Answer is B

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Problem 32

TRUE

Based on the rule at 1.430(d)-1(d)(1)(i), the Funding target and the Target normal cost are based on the plan provisions adopted by the valuation date. The benefits can have a later effective date during the current plan year.

Based on the rule at 1.430(d)-1(d)(1)(ii), the plan provisions can be adopted after the valuation date. Under 412(d)(2), the plan administrator must elect retroactive treatment of the amendment. Then the amendment is treated as if it is adopted on the first day of the plan year for purposes of IRC 430.

Answer is A

Problem 33

Similar to 2011 #39

Revised 10/19/16

This is a simplified question on the quarterly contribution requirement. There are several steps in the solution to this question:

1. Is the plan sponsor subject to the quarterly contribution requirement?
2. What is the amount of the required quarterly contribution installment?
3. How do you discount the payments made back to the valuation date?

Subject to the quarterly contribution requirement?

To calculate the required quarterly contribution for 2015, you must first determine that the plan is subject to the quarterly contribution requirements. In IRC 430(j)(3), it states that plans with a funding shortfall for the preceding plan year are subject to the quarterly contribution requirements. Since the problem states there is a funding shortfall at 01/01/2014, the plan is subject to the quarterly contribution requirement for 2015.

Calculate required quarterly installment

The next step is calculation of the required annual payment (RAP). The required annual payment (RAP) is defined as the lesser of

- 100% of last year's minimum required contribution (MRC) or
- 90% of this year's minimum required contribution

In this problem, you are not given any details for calculation of the MRC. Instead, you are given the MRC for both 2014 and 2015. The required annual payment (RAP) is the lesser of the 2014 MRC (500,000) or 90% of the 2015 MRC (600,000). The resulting RAP is 500,000. The 2015 required quarterly installment is 25% of the RAP, which is 125,000.

Determine 04/15/2015 required contribution

The key idea of the problem is that the 2015 plan year contributions are normally discounted back to the valuation date using the 2015 effective interest rate (EIR). The problem states that there is a 2015 plan year contribution of 50,000 paid at 02/15/15.

The additional contribution due to meet the 04/15/15 required quarterly installment is simply the difference between the required installment of 125,000 and the contribution of 50,000. There is no interest adjustment for the contribution that is paid early. The resulting value of \$X is 75,000.

Answer is D

NOTE

The answer above is based on the proposed regulation. Based on the rule in the 09/09/2015 final regulation at 1.430(j)-1(c)(3)(ii), you should increase the contribution with interest up to the due date for the next required installment. The resulting answer is in range C:

$$\begin{aligned} X &= 125,000 - 50,000(1.06)^{2/12} \\ &= 74,512 \end{aligned}$$

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Problem 34 – Page 1

Similar to 2013 #23

The key point of this question is handling post-PPA 2006 waivers. This is a relatively “forgiving” question, since you do not have to determine the waiver amortization factor.

Funding Shortfall

The funding shortfall is defined as the excess of the funding target over the 430(f)(4)(B) assets, which equals the actuarial value of assets less the prefunding balance (PB) and the carryover balance (CB).

$$\begin{aligned}\text{Funding S/F} &= \text{Funding target} - (\text{AAV} - \text{CB} - \text{PB}) \\ &= 1,900,000 - (1,500,000 - 0 - 0) \\ &= 400,000\end{aligned}$$

Shortfall Base Exemption

You do not need to think too much about whether this plan satisfies the shortfall base exemption. The transition rule for the applicable percentage expired at the end of the 2010 plan year. The modified funding shortfall is similar to the previously calculated Funding shortfall.

$$\begin{aligned}\text{Modified S/F} &= 100\% * (\text{Funding target}) - (\text{AAV} - \text{PB}) \\ &= \text{NOT zero}\end{aligned}$$

Shortfall amortization installment

The plan is not eligible for the shortfall base exemption. You have to set up the 2015 shortfall amortization base, which is equal to

1. 100% times the Funding target
2. Minus the Actuarial asset value reduced by both CB and PB
3. Minus the present value of prior years' shortfall and waiver amortization installments.

There are five years left in the amortization of the 2014 waiver, and four years left in the amortization of the 2013 waiver. You can look up the amortization factors for the remaining waiver installments based on the first segment rate for 2015 - $\ddot{a}_{\overline{5}|.03}$ is 4.7171 and $\ddot{a}_{\overline{4}|.03}$ is 3.8286.

The problem states that there are no shortfall amortization installments for 2014 and earlier. Now you can determine the 2015 shortfall amortization base:

$$\begin{aligned}\text{S/F Amort base} &= 100\% * (\text{Funding target}) - (\text{AAV} - \text{CB} - \text{PB}) - (\text{PV of PY Amortizations}) \\ &= 1.0 * 1,900,000 - (1,500,000 - 0 - 0) - (44,000 * 3.8286) - (22,658 * 4.7171) \\ &= 400,000 - 168,458 - 106,880 \\ &= 124,662\end{aligned}$$

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Problem 34 – Page 2

You must calculate the shortfall amortization installment for 2015. You are given the 7 year annuity factor in the tables with the exam:

$$\begin{aligned}\text{S/F amort} &= 124,662 / 6.3293 \\ &= 19,696\end{aligned}$$

$$\text{S/F charge} = 19,696$$

The shortfall amortization charge is defined as the sum of all the shortfall amortizations. The shortfall amortization charge is limited so it is never less than zero. It is allowable for any individual shortfall amortization installment to be less than zero.

Minimum Required Contribution

In general, the minimum required contribution (MRC) is defined as the target normal cost plus the shortfall amortization charge and the waiver amortization charge, all at the valuation date.

$$\begin{aligned}\text{MRC} &= \text{TNC} + \text{Shortfall amort charge} + \text{Waiver amort charge} \\ &= 100,000 + 19,696 + (44,000 + 22,658) \\ &= 186,354\end{aligned}$$

But you don't really need to calculate the MRC. This problem asks for "the maximum funding waiver" as of 01/2015 for the 2015 plan year.

The key idea of the problem is that "you can't waive a waiver". For the 2015 plan year, the plan sponsor must contribute an amount that is no less than the sum of the amortizations of the 2013 and 2014 waivers. The amount that you can waive is the sum of the target normal cost and the shortfall amortization installment:

$$\begin{aligned}\$X &= 100,000 + 19,696 \\ &= 119,696\end{aligned}$$

Answer is A

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Problem 35

Similar to 2009 #12

TRUE

People receiving Social Security disability benefits are typically severely disabled. Relatively few participants in a typical pension plan would satisfy that definition of disability.

If a plan has a fairly liberal definition of disability, more participants would be able to satisfy the definition of disability. In this case, the disability incidence rates would be larger.

Answer is A

Fall 2014 EA-2F Exam Solutions

Problem 36

FALSE

Based on the rule at IRC 4971(e)(2)(A), all the controlled group members are liable for the tax:

"(A) In general

If an employer referred to in paragraph (1) is a member of a controlled group, each member of such group shall be jointly and severally liable for the tax ..."

Answer is B

This asset valuation question has rarely been asked for a multiemployer plan since PPA was passed. This is such an old topic that this is essentially a trick question! These calculations are almost identical to those for some recent questions on single employer plans.

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. The final actuarial value of assets can't be lower than 80% of market value. The final actuarial value of assets can't be greater than 120% of market value. The final test ensures that the resulting AAV falls between 80% and 120% of the market value.

(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 years' gain or loss. With a five year average, the fractions are $\frac{4}{5}$, $\frac{3}{5}$, $\frac{2}{5}$, and $\frac{1}{5}$. 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 $\frac{1}{3}$.

You are given the G/L amounts for 2011 through 2013. You need to calculate the 2014 G/L item. To do this, you need to calculate the expected market value of assets at 01/01/15.

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Problem 37 – Page 2

Revised 09/07/18

01/01/15 Asset calculation

$$\begin{aligned} 01/15 \text{ } _e\text{MVA} &= (1.06)*620,000 - [1+ .06(6/12)]*80,000 + [1+ .06(5/12)]*55,000 \\ &= 631,175 \end{aligned}$$

$$\begin{aligned} \text{MVA G/L} &= 01/15 \text{ MVA} - 01/15 \text{ } _e\text{MVA} \\ &= 635,000 - 631,175 \\ &= 3,825 \quad (\text{Gain}) \end{aligned}$$

Preliminary

$$\begin{aligned} 01/15 \text{ AAV} &= 01/15 \text{ MVA} - 4/5(2014 \text{ G/L}) - 3/5(2013 \text{ G/L}) - 2/5(2012 \text{ G/L}) - 1/5(2011 \text{ G/L}) \\ &= 635,000 - .80(3,825) - .60(-59,000) - .40(-33,000) - .20(-19,000) \\ &= 684,340 \end{aligned}$$

This preliminary actuarial asset value of 684,340 must be compared to the corridors. The final AAV must be limited to be within 20% of the market value.

$$\begin{aligned} 01/15 \text{ AAV} &= \text{Lesser of } [1.20(635,000) \text{ and greater of } (684,340 \text{ or } .80(635,000))] \\ &= 684,340 \end{aligned}$$

The corridor has no impact on the AAV.

Answer is D

NOTES:

1. In the calculation of the AAV above, asset gains are treated as positive numbers, and asset losses are treated as negative numbers. Of course this does not match the signs for the asset gains and losses given in the problem.
2. If you used compound interest to calculate the expected market value, the MVA at 01/2015 and the G/L value for 2014 are slightly different. As expected, the final value falls in the same answer range.

$$\begin{aligned} 01/15 \text{ } _e\text{MVA} &= 631,187 \\ 2014 \text{ G/L} &= 3,813 \\ 01/15 \text{ AAV} &= 684,349 \quad (\text{corridor does not apply}) \end{aligned}$$

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Problem 38

FALSE

Based on the rule at IRC 432(a)(1), a plan in endangered status must adopt a funding improvement plan.

Answer is B

NOTE

Based on the rule at IRC 432(a)(2), a plan in critical status must adopt a rehabilitation plan.

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Problem 39 – Page 1

Similar to 2012 #34

The key to this problem is doing calculations under the Frozen Initial Liability (FIL) cost method. The normal cost is equal to the present value of future normal costs (PVNC) divided by the average temporary annuity for active participants.

The first step is to determine the present value of future benefits.

<u>Description</u>	<u>Smith</u>	<u>Jones</u>	<u>Brown</u>
01/2015 Age	50	60	65
Projected benefit	12(2,500) = 30,000	12(3,500) = 42,000	12(1,250) = 15,000
PV future benefits	$30,000(D_{65} / D_{50}) \ddot{a}_{65}^{(12)}$ $30,000(1.07)^{-15}(10.11)$ = 109,930	$42,000(D_{65} / D_{60}) \ddot{a}_{65}^{(12)}$ $42,000(1.07)^{-5}(10.11)$ = 302,748	$15,000 \ddot{a}_{65}^{(12)}$ $15,000(10.11)$ = 151,650

Now you can calculate the FIL PVNC:

$$\begin{aligned}
 \text{FIL PVNC} &= \text{PVB} - \text{AAV} - \text{UAL} \\
 &= 564,328 - 261,000 - 34,000 \\
 &= 269,328
 \end{aligned}$$

In this problem, you are told that the plan benefits are not based on pay. The problem gives you data for both active and non-active participants. To calculate the average temporary annuity, you ignore the non-active participant (because Brown's future working lifetime is zero).

<u>Description</u>	<u>Smith</u>	<u>Jones</u>
01/2015 Age	50	60
Temporary annuity	$\ddot{a}_{50:15}$ $= \ddot{a}_{15 .07}$ = 9.7455	$\ddot{a}_{60:5}$ $= \ddot{a}_{5 .07}$ = 4.3872
PVL/L	$ \begin{aligned} &= (9.7455 + 4.3872) / 2 \\ &= 7.0663 \end{aligned} $	

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Problem 39 – Page 2

$$\begin{aligned}\text{FIL NC} &= \text{FIL PVNC} / (\text{PVL/L}) \\ &= 269,328 / 7.0663 \\ &= 38,114\end{aligned}$$

Answer is B

Problem 40

Revised 10/19/16

FALSE

The plan was frozen after the PPA 2006 "cutoff date" of 09/2005. Since the AFTAP is less than 80%, this plan is currently subject to the IRC 436(d) restrictions. As a result, benefits can not be paid under the Social Security Level Income option.

The regulation requires that this limitation is only reflected for benefits which are currently in pay status. You should not reflect this restriction for employees who are currently active (future retirees).

See the regulation at 1.430(d)-1(c)(1)(iii)(C).

Answer is B

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Problem 41

TRUE

This question is on an important rule in the 430 regulations with respect to the effect that the IRC 436 restrictions can have on the 430(f)(3) balance elections (to apply towards the minimum required contribution, and for quarterly contributions). When an IRC 436 restriction applies during the plan year, it can have a retroactive effect. Any "deemed reduction" in the carryover / prefunding balance occurs as of the valuation date, and may reduce the amount of the balance available for elections related to required quarterly installments after the valuation date.

See the regulation at 1.430(f)-1(d)(1)(ii)(B).

Answer is A

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Problem 42

Similar to 2009 #53

FALSE

IRC 4971 defines the amount of the excise tax. But it does not have a clear definition of the precise date used to determine the unpaid minimum required contribution. The April 15, 2008 proposed regulation on IRC 4971 does define the unpaid minimum contribution as determined at the valuation date.

Answer is B

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Problem 43 – Page 1

Similar to 2013 #45

The key to this problem is that you must know how to do calculations under the Entry Age Normal method. The main point of this question is handling of the salary scale when you calculate the Entry Age Normal accrued liability.

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. With a salary scale assumption, the EANC is defined so that it is equal to a level percentage of pay at each age.

$$EANC = \frac{PVB_{EA}}{s\ddot{a}_{\overline{EA:RA-EA}|}}$$

Age 50 at 01/01/15

Entry age 35

Past service 15

Based on the exam conditions, normal retirement age is 65 by default. To calculate the present value of future benefits, you need to calculate the projected monthly benefit at age 65.

Retirement age	65
2014 pay - age 49	50,000
Age 64 pay	$50,000(1.03)^{15}$ $= 77,898$
Projected benefit	$50\%(77,898)$ $= 38,949$
PVB at entry age	$38,949(D_{65} / D_{35}) \ddot{a}_{65}^{(12)}$

There are no commutation functions given. Based on 2014 exam condition 18, there are no pre-retirement decrements. You need to use an interest-only discount at 7% for periods prior to age 65.

The problem asks for the accrued liability at 01/01/2015. There are three ways to calculate the EAN accrued liability. The prospective and retrospective formulas require you to calculate the Entry Age Normal cost:

Prospective

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

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Problem 43 – Page 2

Retrospective

$$\text{EAN AL} = (\text{EANC}) \ddot{s}_{\overline{\text{EA:CA-EA}}|}$$

The third formula uses the ratio of two annuities (at entry age) times the PVB at the current age:

$$\begin{aligned}\text{EAN AL} &= \text{PVB}_{\text{CA}} * (\ddot{s}_{\overline{\text{EA:CA-EA}}|} / \ddot{s}_{\overline{\text{EA:RA-EA}}|}) \\ &= \text{PVB}_{\text{CA}} * (\ddot{s}_{\overline{35:15}|} / \ddot{s}_{\overline{35:30}|})\end{aligned}$$

Now you must evaluate these annuities. There are no pre-retirement decrements, but you need to evaluate an increasing temporary annuity:

$$\begin{aligned}\ddot{s}_{\overline{35:15}|} &= [1 + (1.03/1.07)^1 + (1.03/1.07)^2 + \dots + (1.03/1.07)^{14}] \\ &= \ddot{a}_{\overline{15}|j} \text{ where } 1+j = 1.07/1.03 \rightarrow j = 3.883\% \\ &= 11.6448\end{aligned}$$

$$\begin{aligned}\ddot{s}_{\overline{35:30}|} &= \ddot{a}_{\overline{30}|3.883\%} \\ &= 18.2204\end{aligned}$$

Now you can calculate the PVB at current age, and then the EAN accrued liability:

PVB at age 50	$\begin{aligned}&38,949(D_{65} / D_{50}) \ddot{a}_{65}^{(12)} \\ &= 38,949(v^{15} {}_{15}p_{50}) \ddot{a}_{65}^{(12)} \\ &= 38,949(1.07)^{-15}(10.11) \\ &= 142,723\end{aligned}$
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$$\begin{aligned}\text{EAN AL} &= 142,723(11.6448 / 18.2204) \\ &= 91,215\end{aligned}$$

Answer is C

NOTE

This is not too much work for a 5 point question - nice! You can also check your work by calculating the EAN accrued liability using one of the other two formulas. I will leave that as an exercise for the student.

Fall 2014 EA-2F Exam Solutions

Problem 44 – Page 1

Similar to 2013 #43

The key to this problem is the calculation of the deductible limit under IRC 404(o). You need to know the definition of the cushion amount, and the alternative At-Risk definition of the deductible limit.

Deductible Limit

The deductible limit is defined as the greater of the minimum contribution required under IRC 430 and the amount under 404(o)(2). IRC 430 defines “the minimum required contribution” as the amount prior to reduction by the carryover balance or the prefunding balance. This problem does not give the IRC 430 minimum contribution, so you should ignore that item.

The maximum deductible limit is defined under 404(o)(2)(A):

Target normal cost + Funding target + Cushion amount - Actuarial asset value

The problem gives you the funding target on three sets of assumptions. One uses the At-Risk assumptions, and has been provided for use in the alternative definition of the deductible limit.

Cushion Amount

The Cushion amount is defined as the sum of two pieces:

- (1) 50% of the Funding target, and
- (2) the increase in the Funding target due to allowing for future pay increases.

$$\begin{aligned}\text{Cushion amount} &= 50\%(\text{FT}) + \Delta\text{FT due to pay increases} \\ &= .5(7,000,000) + (10,000,000 - 7,000,000) \\ &= 6,500,000\end{aligned}$$

Now you can calculate the deductible limit. This calculation uses the non At-Risk funding target. This plan is not in At-Risk status, based on 2014 exam condition 45.

Target normal cost	600,000
+ Funding target	7,000,000
+ Cushion amount	6,500,000
Sub-total	14,100,000
Less unreduced AAV	5,000,000
Deductible limit	9,100,000

In most cases, this will be the final deductible limit - but you need to check the alternative definition, as shown on the next page.

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Problem 44 – Page 2

Alternative Deductible Limit: At-Risk

For plans that are not At-Risk, there is an alternative definition of the deductible limit in 404(o)(2)(B):

“Final” At-Risk Target normal cost + “Final” At-Risk Funding target - Actuarial asset value

This calculation uses values determined as if the plan is in At-Risk status. The problem gives you the values of the normal cost and funding target for use in this alternative deductible limit definition.

At-Risk Target normal cost	800,000
+ At-Risk Funding target	9,000,000
Sub-total	9,800,000
Less unreduced AAV	5,000,000
Deductible limit	4,800,000

The alternative definition has no effect on the deductible limit. The final deductible limit is 9,100,000.

Answer is B

NOTE

Some prior exam problems have not given you the At-Risk values of the target normal cost and funding target. If this plan had some type of subsidized early retirement benefit, or optional forms of payment, then you would need to calculate the At-Risk values of the Funding target and the Target normal cost.

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Problem 45 – Page 1

Similar to 2012 EA-2L #28

Revised 10/15/15

This is the first question asked on the EA-2F exam which required more than a tiny bit of knowledge about the mechanics of a cash balance plan (A.K.A. applicable defined benefit plan). The key idea is that you accumulate the current account balance each year and add in a new pay credit. The problem gives you the historical asset returns. Each year the pay credit is 50,000:

Year	01/01 account	Asset Return	Pay Credit	12/31 account	Pay credit + Interest credit
2012	0	-10.00%	50,000	50,000	$= 50,000 + (1-.10)*\text{zero}$
2013	50,000	-12.00%	50,000	94,000	$= 50,000 + (1-.12)*50,000$
2014	94,000	0.00%	50,000	144,000	$= 50,000 + (1+.00)*94,000$
2015	144,000				

At 01/01/15, the participant is age 60 with three years of service. The participant is assumed to retire at age 65, and receive a lump sum. The Funding target is the present value at 01/01/15 of the lump sum they would receive at age 65:

Valuation date	01/01/2015
Age	60
Past service	3
Account balance	144,000

Now you can calculate the Funding target under both the old and new assumptions. There are three segment interest rates, but the benefit payments are discounted back to the valuation date using a single rate, based on which segment they fall into.

The lump sum payment at age 65 does not fall within the first five years. The present value of the lump sum payment at 65 is calculated using the second segment rate of 6%:

OLD assumptions - interest crediting rate 0%	
Normal retirement	65
Past service	8
Projected account balance at 65	$144,000(1.00)^5$ $= 144,000$
Funding Target	$144,000(1.06)^{-5}$ $= 107,605$

The key point of the problem is that the projected account balance at 65 can not be that small. The “preservation of capital” provision in IRC 411(b)(5)(B)(i)(II) states that the account balance can not be less than the sum of the contributions credited to the account. As a result, the projected account balance at 65 can not be less than $150,000 = 3*50,000$.

	OLD assumptions - interest crediting rate 0%	NEW assumptions - interest crediting rate 4%
Normal retirement	65	65
Past service	8	8
Projected account balance at 65	$144,000(1.00)^5$ = 144,000 150,000	$144,000(1.04)^5$ = 175,198
Funding Target	$150,000(1.06)^{-5}$ = 112,089	$175,198(1.06)^{-5}$ = 130,918

The difference in the Funding Target due to the change in the interest crediting rate assumption is 18,829 (which is equal to 130,918 - 112,089).

Answer is A

NOTE

In the regulation, it is clear that the “preservation of capital” test is only done once, at the annuity starting date. From the regulation at 1.411(b)(5)-1(d)(2)(i):

“Preservation of capital requirement—

A statutory hybrid plan satisfies the requirements of section 411(b)(1)(H) only if the plan provides that the participant’s benefit under the statutory hybrid benefit formula determined as of the participant’s annuity starting date is no less than the benefit based on the sum of all principal credits (as described in paragraph (d)(1)(ii)(D) of this section) credited under the plan to the participant as of that date (including principal credits that were credited before the applicable statutory effective date of paragraph (f)(1) of this section).”

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Problem 46

TRUE

This funding target definition seems to be correct. It conforms to my idea of funding under the Unit Credit method. It would not make sense to determine the funding target based on anticipation of future years of service after the valuation date.

Answer is A

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Problem 47

Similar to 2011 #35

Revised 09/12/16

The key to this problem is doing calculations under the Aggregate (AGG) cost method. Another point of the problem is handling of the credit balance.

The normal cost is equal to the present value of future normal costs (PVNC) divided by the average temporary annuity for active participants. In this problem, you are given the present value of future compensation. You must calculate the average temporary annuity including a salary scale.

Under the Aggregate method, there is no unfunded accrued liability. The general formula for the PVNC allows for any prior amortization bases, which could include waiver amortization bases, or bases due to a change away from the "shortfall method".

$$\begin{aligned}\text{AGG PVNC} &= \text{PVB} - \text{AAV} - (\text{O/S 431 bases} - \text{CB}) \\ &= 3,930,000 - 2,530,000 - (0 - 20,000) \\ &= 1,420,000\end{aligned}$$

$$\begin{aligned}\text{PVE/E} &= 4,770,000 / 540,000 \\ &= 8.8333\end{aligned}$$

$$\begin{aligned}\text{AGG NC} &= 1,420,000 / 8.8333 \\ &= 160,755\end{aligned}$$

The problem asks for the "smallest amount" at 12/31/2015. Based on 2014 exam condition 35, the "smallest amount" reflects offsetting the funding standard account credit balance (CB) against the minimum contribution. Now you can set up the MFSA and calculate the 12/31/15 "smallest amount":

2015 Minimum Funding Standard Account			
Charges		Credits	
Normal Cost	160,755	Credit Balance	20,000
		12/31 minimum	x
7.0% interest	11,253	7.0% interest	1,400
Total charges	<u>172,008</u>	Total credits	<u>x + 21,400</u>

The "smallest amount" at 12/31/15 is $150,608 = 172,008 - 21,400$. This includes interest to 12/31, and reflects offsetting the credit balance against the minimum contribution.

Answer is C

Fall 2014 EA-2F Exam Solutions

Problem 48 – Page 1

Similar to 2004 #06

This gain / loss question has not been asked since PPA was passed. This is such an old topic that this is essentially a trick question!

The key to this problem is the derivation of the average temporary annuity used for the normal cost calculation at 01/01/2015. The first step is to set up the actual balance sheet at 01/01/14.

Item	Actual 01/01/14
PVB	30,000,000
AAV	10,000,000
CB	Zero
PVNC	$20,000,000 - 10,000,000$ $= 20,000,000$
PVE	200,000,000
Earnings	10,000,000
PVE / E	$20,000,000 / 10,000,000$ $= 20.0$
NC	$20,000,000 / 20.0$ $= 1,000,000$

The next step is to write formulas for the values in the expected balance sheet. At first, you should assume all assumptions are met. Later you can allow for the difference between the salary scale of 6% and the actual compensation increases of 10%.

Item	Actual 01/01/14	Expected 01/01/15
PVB	30,000,000	$(1.07)(30,000,000) - (BP+i)$ $= 32,100,000 - (BP+i)$
AAV	10,000,000	$(1.07)(10,000,000 \text{ AAV}$ $+ 1,000,000 \text{ NC}) - (BP+i)$ $= 11,770,000 - (BP+i)$
CB	Zero	Zero
PVNC	$20,000,000 - 10,000,000$ $= 20,000,000$	$(1.07)(20,000,000 \text{ PVNC}$ $- 1,000,000 \text{ NC})$ $= 20,330,000$
NC	$20,000,000 / 20.0$ $= 1,000,000$	$(1.06)(1,000,000)$ $= 1,060,000$

If all assumptions are met, the expected normal cost at 01/01/15 should be the same percentage of pay as at 01/01/14. Since the expected pay increases with the salary scale each year, the expected normal cost will also increase with the salary scale.

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Problem 48 – Page 2

The problem asks for the absolute value of $\$X - \Y . X is defined as the smallest amount that satisfies the minimum funding standard at 12/31/15, assuming all assumptions were met. Since the credit balance is zero, the value of X is the expected normal cost increased with interest to 12/31/15:

$$\begin{aligned} X &= 1.07(1,060,000) \\ &= 1,134,200 \end{aligned}$$

Now you must determine the value of Y , which is defined as the smallest amount that satisfies the minimum funding standard at 12/31/15, based on actual experience. You can use the expected values of the normal cost and PVNC at 01/01/15 to calculate the PVE/E at 01/01/15.

$${}_ePVNC / {}_ePVE/E = {}_eNC$$

$$\begin{aligned} {}_ePVE/E &= {}_ePVNC / {}_eNC \\ &= 20,330,000 / 1,060,000 \\ &= 19.1792 \end{aligned}$$

The only item that changes at 01/01/2015 is the present value of future benefits. The PVE/E ratio does not change, since the 10% pay increase affects both items by the same amount.

Item	Expected 01/01/15	Actual 01/01/15
PVB	$(1.07)(30,000,000) - (BP+i)$ $= 32,100,000 - (BP+i)$	$(1.07)(1.10/1.06)(30,000,000) - (BP+i)$ $= 33,311,321 - (BP+i)$
AAV	$(1.07)(10,000,000 \text{ AAV}$ $+ 1,000,000 \text{ NC}) - (BP+i)$ $= 11,770,000 - (BP+i)$	$(1.07)(10,000,000 \text{ AAV}$ $+ 1,000,000 \text{ NC}) - (BP+i)$ $= 11,770,000 - (BP+i)$
CB	Zero	Zero
PVNC	$32,100,000 - 11,770,000$ $= 20,330,000$	$33,311,321 - 11,770,000$ $= 21,541,321$
PVE / E	19.1792	19.1792
NC	$(1.06)(1,000,000)$ $= 1,060,000$	$21,541,321 / 19.1792$ $= 1,123,158$

$$\begin{aligned} Y &= 1.07(1,123,158) \\ &= 1,201,779 \end{aligned}$$

$$\begin{aligned} |X - Y| &= 1,201,779 - 1,134,200 \\ &= 67,579 \end{aligned}$$

Answer is D

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Problem 48 – Page 3

NOTES

1. The problem states that all participants are active and under age 50. This is important for determining the actual valuation results at 01/01/2015. The benefit payment terms are actually zero. You also know that all employees survived during 2014 (no deaths or retirees), and everyone's pay increased by 10%.
2. The key point of the problem is the determination of the PVE/E ratio at 01/01/15. In some prior exam problems, you could not "back into" the PVE/E calculation using the values of the normal cost and PVNC in the expected balance sheet. There is a way to directly calculate the expected PVE/E:

Item	Actual 01/01/14	Expected 01/01/15
PVE / E	$20.0 = \frac{20,000,000}{10,000,000}$	$\frac{(1.07)*(20.0-1.0)}{p_x(1.06)}$ $= 19.1792$

Assume that $(1+s)$ is the increase factor for the salary scale, and $(1+i)$ is the increase due to the valuation rate of interest. Here is the derivation of the expected PVE/E formula:

$${}_ePVE_1 = (1+i)(PVE_0 - EARN_0)$$

$${}_eEARN_1 = p_x(1+s)(EARN_0)$$

$$\begin{aligned}\frac{{}_ePVE_1}{{}_eEARN_1} &= \frac{(1+i) * (PVE_0 - EARN_0)}{p_x(1+s) * (EARN_0)} \\ &= \frac{(1+i) * (PVE_0/EARN_0 - 1.0)}{p_x(1+s)}\end{aligned}$$

The calculation of the expected PVE/E assumes that the value of p_x is 1.0 at all ages (no pre-retirement decrements). This assumption is based on 2014 exam condition #18.

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Problem 49 – Page 1

Similar to 2013 #27

The key point of this problem is the calculation of the liquidity shortfall. The liquidity shortfall for a quarter equals the base amount minus the liquid assets, both at the end of the quarter. It can't exceed the amount which, when added to prior installments for the plan year, increases the funding target attainment percentage (FTAP) to 100% (including the expected increase due to benefits accruing during the year).

Liquid assets are items for which there is a liquid financial market, such as cash, stocks, and bonds. The base amount equals 3 times adjusted disbursements from the plan for the 12 months ending on the last day of the quarter.

Adjusted disbursements equal all disbursements from the plan less the Funding target attainment percentage (FTAP) times the sum of annuity purchases, lump sums, and other accelerated payments. Based on the Schedule SB instructions, the FTAP is calculated by truncating to .01%.

You are given disbursements for the four quarters ending 03/31/2015:

$$\begin{aligned}\text{All Disbursements} &= 265,000 + 22,000 + 250,000 + 200,000 \\ &= 737,000\end{aligned}$$

$$\begin{aligned}\text{Accelerated payments} &= 250,000 \text{ lump sums} + 200,000 \text{ annuity purchases} \\ &= 450,000\end{aligned}$$

$$\text{FTAP} = \frac{(\text{AAV} - \text{CB} - \text{PB})}{\text{Non At-Risk FT}} \quad \text{given as 90\%}$$

$$\begin{aligned}\text{Adjusted disburse.} &= 737,000 - .90(450,000) \\ &= 332,000\end{aligned}$$

$$\begin{aligned}\text{Base amount} &= 3 \times 332,000 \\ &= 996,000\end{aligned}$$

The problem gives you the liquid assets at 3/31/2015 as 900,000. This asset is identified as "prior to adjustment" - more about this later. It should be clear that this asset value must include the 250,000 contribution that was paid at 02/01/2015.

$$\begin{aligned}\text{Liquidity Shortfall} &= 996,000 \text{ base amount} - 900,000 \text{ liquid asset} \\ &= 96,000\end{aligned}$$

Answer is C

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Problem 49 – Page 2

NOTES

1. The liquidity shortfall can't exceed the amount which, when added to prior installments for the plan year, increases the funding target attainment percentage (FTAP) to 100%. But that calculation reflects the expected increase due to benefits accruing during the year (the target normal cost). Since that is not given in this problem, you must ignore the cap on the liquidity shortfall.
2. What about that statement in the problem that the liquid value of assets is "prior to adjustment"? What about all that stuff in Revenue Ruling 95-31 that shows how to interest adjust the contribution to the end of the quarter?

"Q&A-16:

... The value of a plan's liquid assets must be reduced by the amount of any liability or other obligation of the plan (other than liabilities of the plan for benefits payable under the plan). The value of the plan's liquid assets as of the last day of any quarter must also be reduced by subtracting certain contributions (adjusted with interest to the last day of the quarter at the plan's valuation interest rate. ..."

You don't need to do any of that stuff. If you look closely at the example for Q&A 16 of Revenue Ruling 95-31, they first add, and then subtract the same adjusted contribution amount. You get exactly the same answer when you ignore the interest adjustment for the contribution. It definitely saves time on the exam when you do NOT do these steps:

03/31/15 Initial base amount	996,000
03/31/15 Initial liquid assets	900,000
02/01/15 payment (liquid assets) for 1st quarter 2015	250,000
02/01/15 contribution adjusted to 03/31/15:	$250,000 * (1.07)^{2/12}$
	252,835
03/31/15 adjusted liquid assets:	$900,000 - 252,835$
	= 647,165
03/31/15 liquidity shortfall	$996,000 - 647,165$
	= 348,835
04/15/15 payment to satisfy liquidity requirement:	$348,835 - 252,835$
	= 96,000

Note the timing on this - asset values are determined at 03/31/15, but the payment to satisfy the liquidity requirement is actually due 04/15/15 (same as required quarterly installment).

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Problem 50 – Page 1

Similar to 2012 #47

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.

The problem asks for the "smallest amount" at 12/31/2013. Based on 2014 exam condition 35, the "smallest amount" reflects offsetting the funding standard account credit balance (CB) against the minimum contribution.

12/31/2014 Credit balance

The problem does not give you the amount of the CB at 12/31/2014. You must set up the 2014 MFSA to calculate it:

2014 Minimum Funding Standard Account			
Charges		Credits	
Normal Cost	350,000	Credit Balance	1,000,000
Net amortization charges	400,000	12/31 contribution	300,000
7% interest	52,500	7% interest	70,000
Total charges	802,500	Total credits	1,370,000

At 12/31/2014, the plan has a credit balance of $567,500 = 1,370,000 - 802,500$. Don't forget - you need to check the Full Funding Limitation (FFL):

$$\begin{aligned}\$431 \text{ "ERISA" FFL} &= (1+i) \cdot (\text{NC} + \text{AL}) - (1+i) \cdot [\text{lesser (MVA, AAV)} - \text{CB}] \\ &= 1.07 \cdot (350,000 + 7,000,000) - 1.07 \cdot (6,250,000 - 1,000,000)\end{aligned}$$

The FFL clearly exceeds the Minimum Funding Standard Account (MFSA) charges less the amortization credits. There is no FFL credit for 2014.

2014 G/L calculation

The hidden trick in this question is that you must set up a gain / loss base at 01/01/2015 for the 2014 experience. The problem specifies the cost method as Entry Age Normal, but that does not affect the solution. The G/L calculations are the same for all individual cost methods.

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

$${}_e\text{UAL}_1 = (1+i)(\text{NC}_0 + \text{UAL}_0) - (\text{contribution} + i)$$

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Problem 50 – Page 2

$$\begin{aligned}UAL_0 &= AL_0 - AAV_0 \\&= 7,000,000 - 6,250,000 \\&= 750,000\end{aligned}$$

$$\begin{aligned}_eUAL_1 &= 1.07*(350,000 + 750,000) - 300,000 \\&= 877,000\end{aligned}$$

$$\begin{aligned}UAL_1 &= AL_1 - AAV_1 \\&= 7,000,000 - 6,280,000 \\&= 720,000\end{aligned}$$

$$\begin{aligned}01-2015 \text{ gain} &= 877,000 - 720,000 \\&= 157,000\end{aligned}$$

2015 MFSA

To set up the MFSA, you need to determine the amortizations for the 431 bases. The problem gives you the amortizations for all bases set up prior to 01/01/2015.

$$\begin{aligned}\text{Gain amort} &= 157,000 / \ddot{a}_{\overline{15}|.07} \\&= 16,110\end{aligned}$$

Now you can set up the MFSA and calculate the 12/31/15 “smallest amount”:

2015 Minimum Funding Standard Account			
Charges		Credits	
		Credit Balance	567,500
Normal Cost	375,000	Gain amortization	16,110
OLD amortizations	475,000	OLD amortizations	80,000
		12/31 minimum	x
7% interest	59,500	7% interest	46,453
Total charges	<u>909,500</u>	Total credits	<u>x + 710,063</u>

The “smallest amount” at 12/31/15 is $199,437 = 909,500 - 710,063$. This includes interest to 12/31, and reflects offsetting the credit balance against the minimum contribution.

There is one final step required - you need to check the Full Funding Limitation (FFL). But you don't need to do a detailed calculation - it clearly will not apply in 2015.

Answer is B

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Problem 51 – Page 1

Similar to 2009 #37

This is a relatively straightforward 415 problem. The key point of the problem is knowing that the §415 limits are reduced for service (and participation) less than 10 years.

Starting in 1997, earnings under §415 is defined as total compensation (not taxable). Based on the regulation that became final in 2007, earnings under §415 are subject to the §401(a)(17) limit.

At 01/01/14

Age	44
Service	7 years
Participation	5 years

PLAN BENEFIT

The plan benefit is based on three year final average pay, which is given as 200,000. Since you do not have individual years of pay history, you can not apply the §401(a)(17) limit

$$\begin{aligned}\text{Accrued benefit} &= 200,000 * 7 * 10\% \\ &= 140,000\end{aligned}$$

415 COMP LIMIT

The §415(b)(1)(B) compensation limit is reduced when service is less than ten years. This limit is based on the highest three consecutive years of pay:

$$\begin{aligned}\text{3 year final average pay} &= 200,000 \quad (\text{given}) \\ \text{\$415 compensation limit} &= 200,000 * (7/10) \\ &= 140,000\end{aligned}$$

415 DOLLAR LIMIT

Under §415(b)(1)(A), the dollar limit is reduced when participation is less than ten years.

$$\begin{aligned}\text{\$415 dollar limit during 2014} &= 210,000 * (5/10) && \text{for ages 62-65} \\ &= 105,000\end{aligned}$$

The 415 limit on a life annuity basis is the lesser of the compensation limit of 140,000 and the dollar limit of 105,000. The final plan benefit is limited to 105,000.

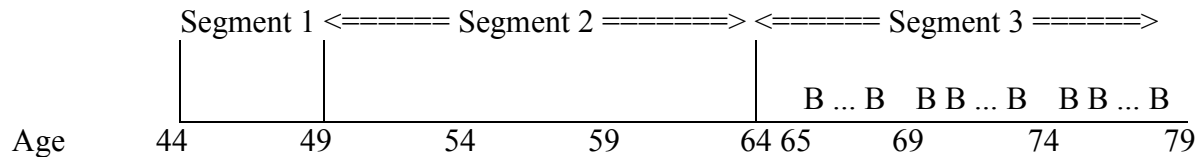
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FUNDING TARGET

The Funding Target is defined as the present value of the accrued benefit. It is similar to the traditional Unit Credit accrued liability.

Based on the default exam conditions, normal retirement age is 65, and the benefit is assumed payable monthly, starting at normal retirement age. The participant is currently 21 years from retirement, so their benefit payments will be valued using the third segment rate:



The calculation of the Funding target uses the accrued benefit. Here is the formula for the Funding target using monthly annuity rates:

$$\begin{aligned}\text{Age 44 FT} &= 105,000 * {}_{21|}\ddot{a}_{44 \text{ seg}_3}^{(12)} \\ &= 105,000(v^{21} {}_{21}p_{44}) \ddot{a}_{65 \text{ seg}_3}^{(12)} \quad \text{all at segment 3 rate}\end{aligned}$$

Based on 2014 exam condition 18, there are no pre-retirement decrements.

$$\begin{aligned}\text{Age 44 FT} &= 105,000(1.075)^{-21}(1.0)(9.79) \\ &= 225,110\end{aligned}$$

Answer is B

NOTE

This is exactly the type of IRC 415 problem that I expect on the EA-2F exam. It is primarily a funding question, and the calculations of the 415 limit were not overly complex.

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Problem 52 – Page 1

Similar to 2012 #47

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.

The problem asks for the "smallest amount" at 09/30/2015. This plan year is not based on the calendar year, but that doesn't change the mechanics of the solution. Based on 2014 exam condition 35, the "smallest amount" reflects offsetting the funding standard account credit balance (CB) against the minimum contribution.

09/30/2014 Credit balance

The problem does not give you the amount of the CB at 09/30/2014. You must set up the 2013 MFSA to calculate it. The problem states that all the amortization bases were combined at 10/01/13, and gives the amortization payment as 525,000.

2013 Minimum Funding Standard Account			
Charges		Credits	
Normal Cost	450,000	Credit Balance	820,000
Amortization charge	525,000	09/30 contribution	565,000
7% interest	68,250	7% interest	57,400
Total charges	1,043,250	Total credits	1,442,400

At 09/30/2014, the plan has a credit balance of 399,150 = 1,442,400 - 1,043,250. Don't forget - you need to check the Full Funding Limitation (FFL).

$$\begin{aligned}\text{\$431 "ERISA" FFL} &= (1+i) \cdot (\text{NC} + \text{AL}) - (1+i) \cdot [\text{lesser}(\text{MVA}, \text{AAV}) - \text{CB}] \\ &= 1.07 \cdot (450,000 + 6,070,000) - 1.07 \cdot (5,750,000 - 820,000)\end{aligned}$$

The FFL clearly exceeds the Minimum Funding Standard Account (MFSA) charges less the amortization credits. There is no FFL credit for 2013.

2014 G/L calculation

The hidden trick in this question is that you must set up a gain / loss base at 10/01/2014 for the 2013 experience. The problem specifies the cost method as Unit Credit, but that does not affect the solution. The G/L calculations are the same for all individual cost methods.

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

$${}_e\text{UAL}_1 = (1+i)(\text{NC}_0 + \text{UAL}_0) - (\text{contribution} + i)$$

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Problem 52 – Page 2

$$\begin{aligned}UAL_0 &= AL_0 - AAV_0 \\&= 6,070,000 - 5,750,000 \\&= 320,000\end{aligned}$$

$$\begin{aligned}_eUAL_1 &= 1.07*(450,000 + 320,000) - 565,000 \\&= 258,900\end{aligned}$$

$$\begin{aligned}UAL_1 &= AL_1 - AAV_1 \\&= 6,750,000 - 4,700,000 \\&= 2,050,000\end{aligned}$$

$$\begin{aligned}10-2014 \text{ loss} &= 2,050,000 - 258,900 \\&= 1,791,100\end{aligned}$$

2014 MFSA

To set up the MFSA, you need to determine the amortizations for the 431 bases. The problem gives you the amortizations for the combined base set up at 10/01/2013.

$$\begin{aligned}\text{Loss amort} &= 1,791,100 / \ddot{a}_{\overline{15}|.07} \\&= 183,788\end{aligned}$$

Now you can set up the MFSA and calculate the 09/30/15 “smallest amount”:

2015 Minimum Funding Standard Account			
Charges		Credits	
Normal Cost	450,000	Credit Balance	399,150
OLD amortizations	525,000		
Loss amortization	183,788	09/30 minimum	x
7% interest	81,115	7% interest	27,941
Total charges	<u>1,239,903</u>	Total credits	<u>x + 427,091</u>

The “smallest amount” at 09/30/15 is $812,813 = 1,239,903 - 427,091$. This includes interest to 09/30, and reflects offsetting the credit balance against the minimum contribution.

There is one final step required - you need to check the Full Funding Limitation (FFL).

$$\begin{aligned}\S 431 \text{ "ERISA" FFL} &= (1+i)*(NC + AL) - (1+i)*[\text{lesser}(MVA, AAV) - CB] \\&= 1.07*(450,000 + 6,750,000) - 1.07*(4,700,000 - 399,150)\end{aligned}$$

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Problem 52 – Page 3

The FFL clearly exceeds the Minimum Funding Standard Account (MFSA) charges less the amortization credits. There is no FFL credit for 2014, and the "smallest amount" is 812,813.

Answer is D

NOTE

I was initially concerned about the size of the amortization payment for the combined base established at 10/01/13. Can you be sure there is still a base at 10/01/14 that needs to be amortized? If not, then there would be no amortization payment in the MFSA.

Here is an alternate approach to derive the G/L base at 10/01/14, which also calculates the outstanding amount of the 431 amortization base:

$$\begin{aligned} \text{UAL}_0 &= \text{AL}_0 - \text{AAV}_0 \\ &= 6,070,000 - 5,750,000 \\ &= 320,000 \end{aligned}$$

10/01/13

$$\begin{aligned} \text{UAL}_0 &= \text{O/S 431 bases} - \text{CB} \\ 320,000 &= \text{Combined}_0 - 820,000 \end{aligned}$$

$$\text{Combined}_0 = 1,140,000$$

10/01/14

$$\begin{aligned} \text{Combined}_1 &= 1.07(1,140,000 \text{ base} - 525,000 \text{ amortization}) \\ &= 658,050 \end{aligned}$$

Note that the combined base is greater than the combined amortization payment. But that won't be true at 10/01/15.

$$\begin{aligned} \text{UAL}_1 &= \text{AL}_1 - \text{AAV}_1 \\ &= 6,750,000 - 4,700,000 \\ &= 2,050,000 \end{aligned}$$

$$\begin{aligned} \text{UAL}_1 &= \text{O/S 431 bases} - \text{CB} \\ &= \text{Combined}_1 + \text{Loss} - \text{CB} \\ 2,050,000 &= 658,050 + \text{Loss} - 399,150 \end{aligned}$$

$$\begin{aligned} \text{10-2014 loss} &= 2,050,000 - (658,050 - 399,150) \\ &= 1,791,100 \end{aligned}$$

As expected, you get the same result for the 10/01/14 G/L base.

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Problem 53 – Page 1

Similar to 2013 #41

The key to working this problem is knowing the special rule in the final 1.430 regulations regarding bringing forward the prefunding balance (PB) based on two different interest rates. The calculation is based on the rule shown in example 4 of the final regulation. The portion of the prefunding balance that is attributed to the sponsor's use of the prefunding balance at the beginning of the year must be increased with interest based on the plan's rate of return on assets.

Carryover balance election

The problem asks for the maximum prefunding balance at 01/01/15. The problem states that the plan sponsor elects to use 20,000 of the 01/01/14 carryover balance (CB) to satisfy the minimum required contribution (MRC) as of 07/01/14. But how much of a reduction does this cause in the 01/01/14 CB (six months prior to the election date)?

The answer lies in rules in the 430 regulation for elections related to required quarterly installments. This problem says there are no quarterly installments required for 2014. Think about what would happen if there was a required quarterly installment at 07/15/14.

The 20,000 would be increased at the 2014 EIR of 6% from 01/01/14 to 07/15/14. The resulting value of 20,641 would be used to satisfy the required quarterly installment at 07/15/14. The 01/01/14 CB would be reduced by the 20,641 discounted from 07/15/14 back to 01/01/14 - and that value is 20,000.

I think the same result should occur when there are no quarterly installments required for 2014. The result is that the 01/01/14 CB should be reduced by 20,000.

Excess contribution

You can calculate the amount of the excess contribution at 01/01/2014. You need to compare the present value of the contribution paid at 07/01/2014 to the MRC. The present value is calculated using the effective rate of interest for the 2014 plan year:

$$\begin{aligned}\text{PV of contrib} &= 200,000 * (1.06)^{-6/12} \\ &= 194,257\end{aligned}$$

Addition to

$$\begin{aligned}\text{2014 PB} &= 194,257 - (150,000 \text{ MRC} - 20,000 \text{ CB applied}) \\ &= 44,257 \text{ excess contribution} + 20,000 \text{ CB applied}\end{aligned}$$

If there was no CB used, then the 01/2015 PB equals the sum of the 01/2014 PB (brought forward using the rate of return on assets for the 2014 plan year) plus the excess contribution (brought forward with the effective rate of interest for the 2014 plan year). But the calculation is not done that way, due to the special rule in the final 1.430 regulations.

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Problem 53 – Page 2

The portion of the prefunding balance that is attributed to the sponsor's use of the carryover balance at the beginning of the year must be increased with interest based on the 2014 rate of return on assets.

$$\begin{aligned} 01/2015 \text{ PB} &= 1.06(44,257 \text{ excess contribution}) + 1.04(\text{zero PB} + 20,000 \text{ CB applied}) \\ &= 67,713 \end{aligned}$$

Answer is D

NOTES

1. You get a slightly different numerical result if you use simple interest. The resulting PV of the contribution is 194,175 and the 01/2015 PB is 67,625. As expected, this is in the same answer range.
2. There is a way to check your calculation, which is to ignore the statement about applying the CB towards the quarterly contribution requirement. The sum of the PB and CB at 01/2015 should be the same, regardless of whether the plan sponsor elects to apply part of any funding balance towards the MRC.

In the solution above, the corresponding 01/2015 CB is $31,200 = 1.04(50,000 - 20,000)$. At 01/2015, the sum of the CB and PB is $98,913 = 67,713 + 31,200$.

Now assume the plan sponsor does not elect to apply 20,000 of the CB towards the quarterly contribution requirement. The 01/2014 carryover balance would be 50,000. The 2014 excess contribution would be $44,257 = 194,257 - 150,000$.

The 01/2015 PB is $46,913 = 1.06(44,257)$. The 01/2015 CB is $52,000 = 1.04(50,000)$. At 01/2015, the sum of the CB and PB is $98,913 = 46,913 + 52,000$. As expected, this is the same value as when the plan sponsor does make the election.

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Problem 54

The key to this problem is calculation of the Funding target under IRC 430(d). The participant is retiring at 12/31/14 with a ten year certain payment form. The Funding Target is defined as the present value of the accrued benefit. It is similar to the traditional Unit Credit accrued liability.

12/31/2014

Smith

Age	64
Past service	10
Accrued benefit	$12,000 = (1,200)(10)$
Early retirement reduction	$.96 = (1 - 4\%(65-64))$
Early retirement benefit	$11,520 = 12,000 * .96$

\$X is the funding target based on the life annuity payment form. Based on the exam conditions, this is a single employer plan. You would normally expect some information regarding segment rates, but nothing is given here. You should use the "magic factor" given on the funding assumptions:

$$\begin{aligned} X &= 11,520(11.50) \\ &= 132,480 \end{aligned}$$

\$Y is the funding target based on the ten year certain payment form. The hidden point of the problem is that you should assume this benefit is actuarially equivalent to the straight life annuity benefit. This is based on 2014 exam condition 10. The ten year certain benefit should be greater than the life annuity benefit, since it is paid for fewer years.

$$\begin{aligned} \text{10 yr certain} \\ \text{benefit} &= 11,520(10.30/7.30) \\ &= 16,254 \end{aligned}$$

To value Y, you should use the "magic factor" given on the funding assumptions:

$$\begin{aligned} Y &= 16,254(7.69) \\ &= 124,995 \end{aligned}$$

$$\begin{aligned} |X - Y| &= 132,480 - 124,995 \\ &= 7,485 \end{aligned}$$

Answer is C

NOTE

There is a minor typographical error in the symbol shown for the ten year certain payment form. But this does not make the problem defective.

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Problem 55

Similar to 2012 #13

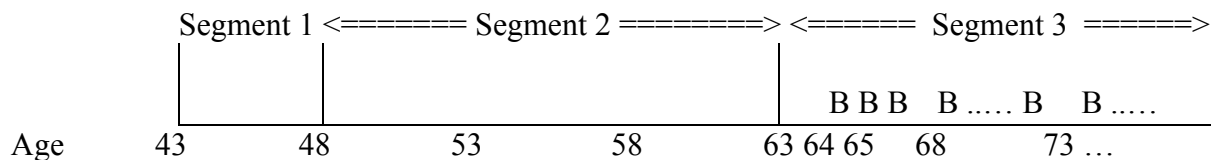
The key point of this question is how you calculate the accrued benefit based on expected compensation for 2015. In general, the funding target and target normal cost are determined based on the plan benefits in effect during the plan year. The accrued benefit is defined based on final compensation. The expected compensation for 2014 uses the 3% salary increase assumption:

$$\begin{aligned} 2014 \text{ Pay} &= 1.03 * 50,000 \\ &= 51,500 \end{aligned}$$

The Funding Target is defined as the present value of the accrued benefit. It is similar to the traditional Unit Credit accrued liability. The remainder of this question is fairly typical on the EA-2F exam.

At 01/01/2015	Actual pay	Expected pay
Age	43	43
Service	17 years	17 years
2014 pay	75,000	51,500
Accrued benefit	$1.5\%(17)(75,000)$ $= 19,125$	$1.5\%(17)(51,500)$ $= 13,133$

Based on the default exam conditions, normal retirement age is 65, and the benefit is assumed payable monthly, starting at normal retirement age. The participant is currently 22 years from retirement, so their benefit payments will be valued using the third segment rate.



The third segment rate is used to value all benefit payments. Based on 2014 exam condition 18, there are no pre-retirement decrements. The present values should use interest-only discounting prior to benefit commencement age.

$$\begin{aligned} FT_{\text{actual}} &= X \\ &= 19,125 * (v^{22} {}_{22}p_{43}) \ddot{a}_{65 \text{ seg}_3}^{(12)} \end{aligned}$$

$$\begin{aligned} FT_{\text{expected}} &= Y \\ &= 13,133 * (v^{22} {}_{22}p_{43}) \ddot{a}_{65 \text{ seg}_3}^{(12)} \end{aligned}$$

$$\begin{aligned} |X - Y| &= (19,125 - 13,133)(1.075)^{-22}(9.79) \\ &= 11,951 \end{aligned}$$

Answer is B